

COMPUTERWORLD

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Panorama of the main FJCC exhibition area. More floor pictures on Page 47.

(CW Photo by Farmer)

17,000 Attend 'Smaller, But Better' FJCC

By the CW News Staff

LAS VEGAS — Gone were the big mainframe exhibits, gone were many of the gimmicks and flashy girls, gone was the heavy handed emphasis on figuratively — and sometimes literally — dragging attendees into exhibits.

Instead the 17,000 persons visiting the 20th anniversary joint computer conference last week found it dominated by the mini-mainframes, like Data General, Digital Equipment, and Hewlett-Packard, and by the peripheral makers.

While the 4,100 conference registrants participated in sessions on "Computers and the Quality of Life," the conference theme, the sobriety of the times was evident on the exhibit floor.

The harsh, luridly lit world of the Las Vegas casinos, which

two years ago insinuated itself into the exhibition, seemed lightyears away.

Conference keynoter Arthur G. Anderson noted that "quality of life" has different meanings for the affluent and the poor and declared that computer applications must fulfill socially useful functions.

Unless social needs are met, the IBM vice-president said, "We're in trouble."

Public awareness of computers was made clear by the results of a public opinion poll jointly sponsored by the American Federation of Information Processing Societies (Afips) and *Time* magazine.

The results, released at the Fall Joint Computer Conference, indicated that 49% of U.S. adults have had on-the-job con-

tact with computers and 30% have direct or indirect contact with computers as part of their current jobs.

President Nixon, in a telegram, congratulated Afips on the con-

ference theme, "Computers and the Quality of Life," noting that it "reflects the challenge of the next 20 years."

With all of the large mainframe makers out of the show for the

first time in years, the highlights of the exhibits were minicomputers, terminals, memories, bulk storage devices, printers, OCR units, and communications

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Public Feels DP Affects Us All, Government Regulation Seen

By Edward J. Bride

Of the CW Staff

LAS VEGAS — Almost all the people think computers are affecting every person in the country, and many think the government will regulate the use of computers.

A survey conducted by *Time*

magazine and the American Federation of Information Processing Societies (Afips) has revealed that 91% of the respondents feel computers are affecting the lives of all of us. Eighty-four percent said the government should be concerned about regulating computer usage.

About 57% said the government probably will determine what computers can or cannot be used for; 61% believe the government is presently "concerned" about regulation.

The survey was compiled last summer, and the results were made public at the Fall Joint Computer Conference here last week.

Bruce Gilchrist, executive director of Afips, said the study was probably the "most comprehensive yet available" on the public's attitude towards computers. A thousand adults from across the country were interviewed last July and August, he noted.

Clark Schiller, director of research at *Time* magazine, said public awareness regarding the many uses of computers is increasing, and noted that industry marketing representatives and

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Disk, Cores, OCR Units, Terminals

New Products Abound at FJCC Exhibition

By Ronald A. Frank

Of the CW Staff

LAS VEGAS — Potter Instrument Co. led the new product announcements at the FJCC with a working plug-compatible 3330 replacement drive that interfaces directly with IBM's 3830 controller. The disk storage system, the DD 4330, is both cheaper and faster than its

IBM counterpart. Deliveries are scheduled for October 1972.

The DD 4330 handles up to four disk storage units which use 3336-type disk packs. The disk has an average access time of 25 msec compared with the 3330's 30 msec.

Included as standard equipment with the disk system are

rotational sensing for increased channel availability, multiple requesting, command retry, and error detection capabilities, Potter said.

The 4330 single drive (spindle) is priced at \$550/mo on a one-year lease. The double drive version costs \$1,030/mo. Comparable double drive IBM 3330 price is \$1,300.

The 5830 controller will be priced at \$1,810/mo on a one-year lease with a purchase price of \$72,400, available in 1973.

In the IBM compatible core area, Electronic Memories & Magnetics Corp. (EMM) announced rental prices for add-on replacements for 360 systems. The memories are available for

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SCD System/One



OBM System One



Potter 4330



Lundy 7000

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Search for Quality of Life

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New Products Abound on Fall Joint Exhibition Floor

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models 30, 40, 50, and 65.

An EMM 32K memory for Model 30 rents for \$800/mo compared with \$1,200/mo for a similar IBM unit. A 128K memory for Model 40 rents for \$2,185/mo compared with IBM's \$3,800/mo. On a two-year lease the 360/30 memory can save users more than \$9,000, EMM said.

Sycor Systems

Sycor upgraded its basic key entry terminal into three "specifically configured" systems, designated System 20, 30, and 40. The System 40 is a remote job entry system using tape cassette storage that can interface with 360 system operating under OS with Hasp.

The Hasp spooled data can be entered into cassette storage and transmitted directly to a 360, Sycor said. A typical System 40 with data terminal, 250 card/min reader, and 50 line/min printer is priced at \$600/mo.

The System 30 is a data communications terminal with computer-compatible tape and 7- or 9 track, 556- or 800 bit/in. The system is designed to serve as intermediate buffer between a CPU and remote terminals. It can transmit data at 1,200- or 2,400 bit/sec over voice-grade lines. The 30 leases for \$425/mo to \$450/mo.

The System 20 adds an extended memory option to the Sycor terminal to increase the unit to a total capacity of 12K bytes. An optional random access memory of 3K bytes is available together with 1K and 2K increments of extended memory. A typical configuration costs about \$350/mo, a spokesman said.

Fabritek Inc. introduced its extended core memory unit that upgrades the 360/22 to 64K bytes compared with IBM's top limit of 32K. The memory, called the 22 plus, costs about

\$800/mo on a two-year lease. A comparable 64K configuration from Information Control Corp. is priced at \$900/mo.

Beehive introduced the Model V alphanumeric/graphic terminal priced at \$3,180. The CRT unit uses a standard TV-type monitor. The device is available for 90 day delivery, Beehive said.

System Development Corp. (SDC) a company best known for its software development, chose the FJCC to introduce its System One intelligent terminal system.

Designed for stand alone, remote job entry, or as a mini-controlled time-sharing system, the System One uses a "cross-coupler" for simultaneous execution and completion of multiple tasks. SDC said it will provide complete software support.

The basic configuration includes a Nova mini with 8K storage, a keyboard CRT, line printer, tape cassette units, and a data modem. Other disk, tape, and card units are available. The system will be priced at \$35,000 to \$38,000.

Initial sales of the System One will begin about the middle of 1972 in the California area. As

SDC develops a field service force, the system will be made available in other areas, a spokesman said.

The OBM System One, a low-cost, off-line OCR reader that can read any one typewritten alphanumeric font at 34 page/min, was introduced by Optical Business Machines, Inc.

The System One uses a laser as a light source to read double-spaced 80-character lines at 5 line/sec. Handwritten numerics and control symbols can be read up to 40 char./line.

Input documents can range from 3 in. by 3 in. to legal size; paper thickness can vary from onion skin to card stock.

The device is self-programming. Areas to be read are marked on a conditioning document that precedes the data sheets in that format.

Although the system can be built to read any typewriter font, OBM recommends that one of the standard OCR fonts, such as OCR-A, be adopted in order to reduce read errors.

Characters that cannot be read are displayed on the control panel through a series of fiber optics. The operator can then make corrections through a key-

board. The keyboard can also be used to alter characters, generate audit trails, and create magnetic tape labels.

Output is on 9-channel, 800 bit/in., IBM-compatible magnetic tape.

The laser is used to overcome the obstacle encountered in trying to provide a long-lived source of monochromatic illumination, for documents being read.

It allows low-cost optics to be used, the company explained, because the fixed frequency of the laser light does not require chromatic compensation of lenses. The laser uses 5 mW of power and cannot set fire to the document being read, said by OBM to happen occasionally in conventional OCR equipment.

The system is priced from \$26,000 to \$34,000 and can economically replace as few as three keypunch operators, the company said, yet can do the work of 100 operators.

Lundy OCR Reader

Lundy Electronics & Systems Inc. introduced its optical character recognition (OCR) System 7000 that can read multiple fonts and uses an air transport system.

The System 7000 is designed for single pass reading of one or two lines that can be either type-written, machine printed, or handwritten, according to Lundy.

The Lundy system can read OCR-A and B, Farrington 7B, mark sense, numeric handprinted characters, and Micr CMC-7 or E-13B fonts. The system operates with a 4K word memory that can be expanded up to 32K.

The pneumatic transport provides high-speed handling of paper or card documents which Lundy said ride on a cushion of air. The system includes the OCR reader, memory, operator's console, and air compressor. It is priced at \$125,000 to \$175,000 with first deliveries scheduled for next April.

A.B. Dick added a new plotting capability to its Videojet printer. The unit was operating with a Varian 620/i controller using special software, a spokesman said. In addition to the Varian interface, housed in one circuit board, other mini interfaces will be developed, a spokesman said.

The Videojet with plotting capability will be priced at \$7,500 for first delivery next August.

Public Believes Computers Affect Us All

(Continued from Page 1)
technicians must keep this in mind when developing new systems and applications.

In general, the public believes the government should increase its use of computers in many areas, that this would make government more effective, and that there will (and should) be increasing governmental involvement in regulation.

Of those surveyed, 63% said large computerized information files will make government more efficient.

There is "major concern,"

Afips said, about the use of large computerized information files. Thirty-eight percent of the respondents believe computers represent a "real threat to people's privacy," and 62% expressed concern that some large organizations keep information about millions of people.

Additionally, 53% believe computerized information files might be used to destroy individual freedom. Almost half the respondents believe there is no way to find out if information stored in computers is accurate.

A crowd of over 200 people

attended the briefing last Tuesday morning, as Gilchrist and Schiller presented the findings.

Over one-third of the respondents have had problems "because of a computer." Billing problems accounted for almost half of those difficulties.

About three-fourths of those surveyed said they had never had problems in getting computerized bills corrected, but of the people who did have troubles, about 12% actually thought the computer was at fault.

Mixed Reactions

There was mixed reaction to billing-type questions and issues of computer reliability. Eight-one percent said computer mistakes were really made by people, and 77% claimed companies frequently blame computers for mistakes really made by their own people.

Attendees took this last statistic as a warning to companies that tell tales of "computer errors," noting the public is becoming more educated regarding the capabilities and limitations of computers.

Schiller, who presented most of the statistics, commented that public attitudes have changed in recent years, mostly favorably. Even so, over half the respondents said people are becoming too dependent on computers, and that computers are dehumanizing people and turning them into "numbers."

Sixty-five percent of these surveyed believe computers are helping raise the standard of living, that computers have helped increase the quality of products and services, and that without computers, American business would be in "serious trouble."

Of those whose opinions had changed in the last five to 10 years, 37% now have more favorable opinions, while 13% have

less favorable; almost half the respondents said their opinions were essentially the same.

'Legitimate Concern'

The public concern exhibited in some areas is "legitimate," Afips President Keith Uncapher commented, adding it "should be recognized in the planning, design, and use of future computer systems."

"While computers have an immense potential for improving our lives, we must guard against the abuse of individual identity, privacy, freedom and basic personal needs" in the search for increased productivity, improved services, and added convenience.

"The computer field bears a major responsibility," he said.

"There is a continuing need for improved systems design, awareness of the principles of 'human engineering,' adequate safeguards for the protection of sensitive data, realization of the social consequences of our work, and a continuing public information program to provide the American public with objective information on computers, their use, and their impact on society."

Copies Available

Copies of the report are available for \$5 from Afips headquarters, 210 Summit Ave., Montvale, N.J. 07645. The report includes about 40 charts and tables.

Time and Afips shared staff duties in developing the questionnaires, and *Time* paid a New York research firm to conduct the study.

Regarding any need for immediate action, Uncapher stated the issues of privacy and government regulation should be studied. He was concerned that the public would turn to the government for regulation, rather than to data processing professionals.

17,000 Attend 'Smaller, Better' FJCC

(Continued from Page 1)
devices.

"Smaller, but better," was the way several attendees described the conference. Overall attendance, at 17,000, was under 20,000 for the first time in four years.

There was less emphasis on OEM exhibits, with end-user displays dominating the floor.

The reduced size of the show, in terms of both attendance and number of exhibits, eliminated many of the problems, such as long lines, poor telephone service, and crowded hotels, that plagued past conferences — in particular the 1969 Las Vegas conference.

Ralph Wheeler, chairman of the conference, said he was "especially pleased" with the large attendance at sessions. Several had standing-room-only in rooms capable of seating over 500 people.

The balance between end-user and OEM displays is clearly the direction that Afips would like to see the JCCs take in its drive to provide a forum for both the manufacturing and user segments of the computer community.

A large number of new products were announced and many others were shown for the first time.

More and more people are getting personally involved with computers, Walter L. Anderson, Afips vice-president said, during a press briefing. This is one reason future JCCs are likely to feature applications and user issues, as well as state-of-the-art technical lectures, he added.

"The audiences are shifting," Anderson commented, and the conferences must shift, too. Applications orientation will be given to conferences as an "addition" to, not replacement for the technical meetings, he stated.

Advice has already been sought from the Afips constituent societies, he said, adding that major user industries such as banking and insurance may participate in future decisions, as early as next fall.

The federation also announced it is planning to depart from the Atlantic City-Las Vegas axis of the past and bring the shows to areas that have higher user populations.

The 1972 spring and fall joints

will still be held in the old areas, but after that the sites of future conferences is up for discussion, according to Bruce Gilchrist, executive director of Afips. The 1974 FJCC will be in Anaheim, Calif., noted Keith Uncapher, Afips president.

Wheeler said the technical program was improved, partially because members of panel discussions were required to submit "position papers" about six months in advance so they could appear in the *Proceedings*.

This prevented panelists from preparing their arguments "on the airplane to Las Vegas," Wheeler commented. He also foresaw a continued trend toward a "broader spectrum" of topics in the sessions — involving not only the people in the computer room, but also — the executives and decision makers.

Attendance at adjunct meetings was reportedly good, despite competition from the night life. Afips did not have evening sessions scheduled, but ACM and the IEEE Computer Society both had special events, culminated by a regular ACM Council meeting Friday, the day after the conference ended.

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Better DP Support 'Needed' by Emerging Nations

By Michael Merritt
Of the CW Staff

LAS VEGAS — While computer salesmen have gone through undeveloped countries "like a dose of salts" in the past, there is a great need in these areas for responsibly supported data processing systems. Minicomputer manufacturers in particular can find a better return on investment in emerging nations than they can in the U.S., according to Alan B. Kamman of Arthur D. Little, Inc., a consulting firm.

Kamman spoke at a technical session on emerging nations at FJCC along with Antonio L. Mesquita of the Brazilian government, and Dr. Benjamin Barg, of the United Nations. The session was chaired by Douglas Wilkinson of Hewlett-Packard International.

Kamman emphasized that each emerg-

ing nation has individual needs, requirements, and capabilities. Some of them, he said, have a surprising amount of data processing sophistication. He cited Ceylon, where some 35,000 jobs have been filled through a computerized job bank, and Romania, which has been using numerical control extensively since the early sixties. Over 90% of Romania's iron and steel is produced by automated systems, he said.

Kamman discussed several ways of classifying underdeveloped countries for data processing needs — both by the areas of development and the level of development. A country that is primarily a producer of natural resources or agricultural goods, for example, has different DP needs than a country whose economy is labor intensive.

Similarly, some countries have no DP skills available in the labor force at all, while others have had some acquaintance with computers.

Kamman stressed that planners and managers in emerging nations must explore their DP needs, and the feasibility of proposed systems thoroughly before making any decisions. He outlined a six-point plan for assessing job needs, involving affected people in the planning process, and designing and implementing a DP system.

He also urged a healthy realism towards DP. If a national airline, for example, wants a computer for status purposes, it should admit this frankly; he added that he believed no airline with less than two million bookings a year could justify a computer on a cost basis. There may be other reasons for getting the computer, though: status, availability of machine time to government agencies, training native workers in DP skills and so on. The managers should assess these reasons frankly, Kamman said.

There are problems besides lack of trained workers that plague DP in under-

developed nations, Kamman said. Lack of hard currency forces these nations to pay a premium price for their equipment, sometimes as much as 100%. Import duties also add to costs.

Some local laws also restrict the progress of automation, and labor unions frequently object to the computer's threat to job security.

Some manufacturers in the past have also oversold their products and provided little or no maintenance, support, and training, Kamman said. He noted that few applications in emerging nations require computers in the \$100,000/yr class, and that small computers and minicomputers may be the optimum solution for many of these applications.

Dr. Barg described the results of a study by the U.N. Secretariat on the usefulness of data processing in accelerating social and economic development in emerging nations.

Language Comparison Possible: Here's How

LAS VEGAS — How good is a programming language? Can you quantify the quality of a language? The FJCC was presented with a first attempt to compare languages rigorously, and an exploration of the difficulties of accomplishing this by Jean E. Sammet of the IBM Corp. in Cambridge, Mass.

Addressing the session on Programming Languages and Language Processors, Ms. Sammet noted that a measure of a language's effectiveness has to consider many factors. First, one must decide whether effectiveness to the user or to the implementor is important; whether a specific application or an area of an application is being considered; and whether conversion to other languages is significant.

Then it is necessary to assemble a set of features — such as ease of writing or debugging, generality, naturalness, simplicity, and succinctness. Ms. Sammet provided a list.

Then one must create weighting factors for the importance of each feature in the list for the viewpoint in question.

And then it is necessary to develop raw scores for actual performance of the language being tested.

Using this system, and scores and weighting factors based on personal judgment rather than measurement, Ms. Sammet presented a comparison between Cobol and PL/I from the viewpoint of a user writing a payroll program. Cobol outperformed PL/I 3-to-2 in this comparison.

Ben Wegbreit of Harvard University presented a paper on a programming language he is developing, ECL. Wegbreit said it is being designed to provide tools to help programmers with "hard" programming problems.

ECL allows problem-oriented description of algorithms and data, facilitates program construction and debugging, and allows programmers to design highly efficient programs by a process of fine tuning, Wegbreit said.

An experimental version of ECL has been running on a PDP-10 since August, Wegbreit added, and programmers are using it for program design.

The language provides functions for arithmetic and logical processing, list processing, multitasking, and "backtracking," which allows the compiler to try a solution and then discard it for another if it turns out to be inefficient.

ECL also has string processor simulation and a variable syntax that allows the language to mimic another language at the volition of the user — software micro-programming.

Parallel processing systems such as the ILLIAC-IV can be best utilized through special programming languages that take advantage of their particular capabilities and limitations.

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Regulatory Decisions Seen Slowing Delphi Projects

By E. Drake Lundell, Jr.
Of the CW Staff

LAS VEGAS — Regulatory and policy decisions are holding back the development of comprehensive computer-based "Delphi" systems, not technology, according to most attendees at the FJCC session on Experiments in On-Line Delphi Research.

Delphi systems are systems for exchanging information among participants in a selected area and are usually done in person, but the advent of computer and communications technology has made it possible for people to participate from widely dis-

persed locations, one of the participants in the session explained.

But since the computer acts primarily as a store and forward medium with incidental processing in such systems, he added, major decisions will have to be forthcoming from agencies such as the Federal Communications Commission before the systems can gain widespread use.

According to one of the participants, Dr. Murray Turoff, who designed the Emisari systems for the Office of Emergency Preparedness, "the Delphi method is basically defined as a method for

the systematic solicitation and collation of informed judgments on a particular topic."

The method "has two important characteristics which distinguish it considerably from a polling procedure," he said. "The first is feedback where the judgments of the individuals are collected... and fed back. The second characteristic is that all responses are anonymous," which allows all participants in the Delphi type exercise to speak freely.

"The primary objective of the Delphi process," Turoff said, "is the establishment of a meaning-

ful group communications structure."

In a typical computer-based Delphi system, a group of doctors around the country could be interconnected to examine the incidence of certain diseases and the success rates of alternative treatments, he said.

Each doctor would be able to enter the system at any time, at his own convenience from a terminal in his hospital or office to find the latest information on treatment of specific ailments.

A conference of this type among doctors would bring them into contact with the latest thinking on the subject and allow them to garner the opinions of their colleagues on specific treatments.

In a way, the system operates like a conference except that it can be distributed over a wide geographic area and continue for months or possibly years.

According to Turoff there are five situations where the Delphi

method of inter-group communication has an advantage over other alternatives:

- "Where the individuals needed to contribute knowledge to the examination of a complex problem have no history of adequate communication and the communication process must be structured to insure understanding."

- "Where the problem is so broad that more individuals are needed than can meaningfully interact in a face to face exchange."

- "Where disagreements among individuals are so severe that the communication process must be refereed."

- "Where time is scarce for the individuals involved and/or geographical distances are large, thereby inhibiting frequent group meeting."

- "Where a supplemental group communication process would be conducive to increasing the efficiency of the face-to-face meeting."

DP Modeling Crucial to Understanding, Solving Many International Problems

By a CW Staff Writer

LAS VEGAS — Computer simulation is a necessity if international problems are to be understood and solved, according to John McLeod, of Simulation Councils, Inc.

Addressing a special open session at FJCC, McLeod said the computer is the "most important tool we have" for imparting information and understanding.

Computer models are fast, he noted. If a suggested event might create a problem, discovering that fact through a model could avoid a "catastrophic social experiment."

McLeod claimed the chief problem of simulation was not

with data, but with people who design and use models. People are naturally biased in some areas, he acknowledged; models must therefore be flexible, he said.

E.W. Paxson of the Rand Corp. was to speak on "computers and the deterrence of war," but his first statement was that "I don't claim computers can deter war."

He is more concerned with the long-term health and security of the nation, over a period of five to 15 years, he commented. Paxson said improved systems for military command and control could prevent the use of powerful weapons, especially if these systems enable the "enemy" to know our intentions and capabilities.

"The enemy must not misinterpret" our intentions, he said. He also called for development of what he called "systems synthesis" or diagnosis of behavioral patterns.

This type of analytical application could strengthen the U.S. position on, for example, the SALT talks, he noted, or in other negotiations. He told the session on "computers and the problems of society" that war had spawned the stored-program computer, and that he hoped continued military research in deterring war might bring other technological spinoffs.

All the ecological, social, and technical problems of society can be reflected in "urban problems," according to Peter Kamnitzer of UCLA.

Kamnitzer claimed previous urban planning systems are "total failures." These systems are complex, open-ended, and they suffer from an absence of goal definition, he noted.

Computer graphics can help

solve some of these problems, since this aspect of computers enables decision makers to have full information and alternatives on which to base decisions.

By Michael Merritt
Of the CW Staff

LAS VEGAS — A personal computer, fitting in an attache case, weighing 15 lb, and containing a CPU, 2K words of memory, color CRT, graphic mouse, and auxiliary disk or tape storage — and costing \$2,000 — is this the computer of the future?

According to one panelist at the FJCC session on the history and future of computer structure, it is Alan Kay of the Xerox Research Laboratory in Palo Alto suggested that one of the main ways to improve computer performance is to do away with swapping, which, he said, would improve throughput by 20 to 1,000 times. The logical culmination of this approach, he said, would be a computer dedicated to one person.

Kay used the comparison of the train and the automobile to clarify his thoughts on individualized computing. A freight train is large, expensive, and unwieldy, and must be marshaled and loaded completely to be economic.

The automobile, on the other hand, is cheap, flexible, and available at will. Similarly, large scale processors may be great for boxcar size jobs, but minis or personal computers can offer users cheap, immediate solutions to many of their problems.

For larger jobs, Kay said, users could turn to computer utilities.

Kay also said that a powerful method of performance evaluation is sorely needed to direct future computer design efforts. He added that manufacturers of integrated circuits are hindering design experimentation by concentrating on the development of Fortran type components — linear addressed memories, adders, and so on.

Another panelist, Prof. C. Gordon Bell of Carnegie Mellon University, and designer of DEC's PDP series computers, described a project in which he is engaged. By combining 16

PDP-11s, Bell said he had been able to achieve performance in the five million instructions/sec range for a cost of \$300,000 to \$500,000.

There are still problems with the concept, Bell said, particularly in conflict for memory access, switching delays, and reliability.

Charles L. Hawley of Control Data Corp.'s research facility at Arden Hills said he felt the basic design of computers, in the largest sense, had remained constant in the last 20 years, and was likely to remain constant.

Hawley, who worked on the large CDC computers, including the Star, described recent advances in computer design such as buffer or cache memories or look-ahead instruction stacks, as "bumps in the lines" of a diagram connecting the essential elements of the computer.

He did say, though, that design

'No Basis for Assuming Software Can Ensure Confidential System'

By a CW Staff Writer

LAS VEGAS — There is no basis for assuming that an all-powerful software system can be designed that will take care of the problems of preserving confidentiality in a national statistical data center if one were to be created," according to a speaker at FJCC.

Sol Dolleck of the Census Bureau said that there needs to be "fuller discussion" of such issues as indirect disclosure and priorities in such systems by scientific and technical groups, in a session that was dominated by papers describing software systems to protect the confidentiality of data bases.

In a general overview of the problem, Dolleck noted that "a particularly difficult problem is that of indirect disclosure through comparisons of analyses of successive tabulations or re-

sults of queries.

"With disclosure analysis that takes account of indirect disclosures, many requests might have to be drastically curtailed after a few initial uses. If there were no auditing for indirect disclosure anyone could specify changes in the classifications or specifications for a sequence of tabulations in such a way as to reveal, after analysis, the desired characteristics of many or all of the individual records."

But even if the problems of indirect disclosure of records is overcome, Dolleck said "the problem of priorities still remains."

Items like priority need more discussion, he said. "It is not sufficient for these discussions to be conducted separately and in isolation," he warned. "There is a need for interchange among all of the groups that are interested in the problems, he added.

COMPUTERWORLD

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New Fed Agency Required for Community Utilities?

By Edward J. Bride

Of the CW Staff

LAS VEGAS — A new federal agency may be needed to control and regulate community information utilities, since the role of the Federal Communications Commission (FCC) is "not clear" on community-antenna television, an FJCC speaker said.

Dr. Burt Nanus of the University of Southern California suggested CATV would be a chief tool in implementing the information utilities, and in bringing computer power to residences, but he said the Communications Act of 1934 may have to be revised before such a utility can become a reality.

Nanus called for continued research on the organizational form of community information utilities, and he stated "many people expect that the carriers will manage the utilities."

This will keep the information utility in the business sector, rather than being government-operated, he suggested. Decisions on safeguarding privacy, on funding, and on other consumer issues will still be made with government supervision, he noted.

Nanus made his remarks in a special open session on "Planning Community Information Utilities." He said the potential users of these utilities, as well as the designers, must decide between the "possible" and the "socially desirable" before these facilities are placed into operation.

Community information utilities are part of the "wired city" concept which one speaker claimed could be a reality this decade.

E.B. Parker of Stanford University claimed that about six prototype utilities could be established as early as 1976, and that a situation approaching "90% saturation" could exist in the mid 1980s.

Funding Needed Now

"Now is the time" to push for government spending in research and development, he said, calling on Afips, the Electronics Industry Association and the Information Industry Association to pressure Washington for funds.

Major difficulties of these utilities, which have been likened to electric utilities which distribute power, would be in the

Software Advances Seen Needed in Data Communications Area

LAS VEGAS — The use of software to establish error control systems in data communications applications was discussed at an FJCC session based on two papers on cyclic redundancy checking written by members of IBM's research staff. More general topics were included, however, in a question and answer period.

Users were advised by the panel to preplan their error correction and/or detection methods before installing data equipment, as the best way to minimize communications costs.

Those attending the session agreed that the use of software in data systems for the control of errors was still largely undeveloped. One user from Nasa, who attended the meeting said that he felt a barrier existed between the technology that was discussed and actual applications that could be useful today.

No Data Study Yet

LAS VEGAS — Despite promises last spring, Afips still has not acted on the call by Sam Wyly at the 1970 SJCC for a study on the subject of data communications. J.C.R. Licklider, named to head the project, changed jobs within MIT and could not work on the idea this summer, Afips President Keith Uncapher said.

social area, not technical, he commented.

Parker noted one of the chief benefits would be in education, with a "greater potential" to create a "better informed electorate." Other uses could be in home voting, remote shopping or "telepurchasing," and in news or entertainment.

Technicians foresee the standard television, a Touch-Tone telephone, and coaxial cable such as that used in CATV as the prime elements in bringing computer power into home usage.

Essentially all the speakers in this session expressed concern over privacy issues, and on the social implications of reducing opportunities to personally communicate with colleagues, school classmates or business acquaintances when community information utilities become a reality.

Status Report

The open session was organized by Dr. Harold Sackman, director of the com-

puter science department at Kansas State University and chairman of the Afips Social Implications Committee.

The session was actually a status report on utilities, and an advance preview of a book which Afips will publish next spring on planning these facilities.

Sackman noted the utilities would bring about "massive social change" and must be designed "for the best interests of the public," both as a whole and on an individual basis. The government does appear "favorable" towards permitting these utilities to evolve into practical usage, he added.

Speakers were concerned about the type, as well as the quantity of funding. Norman Nielson of Stanford University suggested it would take at least 16 computers as powerful as IBM's 360/165s to implement a utility in a city of less than 100,000 population.

A utility of this size could have three times the number of accesses-per-second

as a busy on-line airline reservation system, he noted, and would require 15 times the computing power as these reservations systems.

The utility itself might therefore be a "switching" service instead of a full provider of computation chores, Nielson said. The utility would become a "distributor" of computer power, just as public utilities distribute electric power, while not actually generating it, he noted.

The cost to the public could be as low as \$133 per month, including modification to home TV, cables, and software development, he added. Sufficient system software could take five to seven years to develop, stated Barry Boehm, co-chairman of the session. He reiterated the committee position that government and social "leverage" is needed when such a project is in the early stages.

Once established, the regulatory and rate procedures would be extremely difficult to change, he said.

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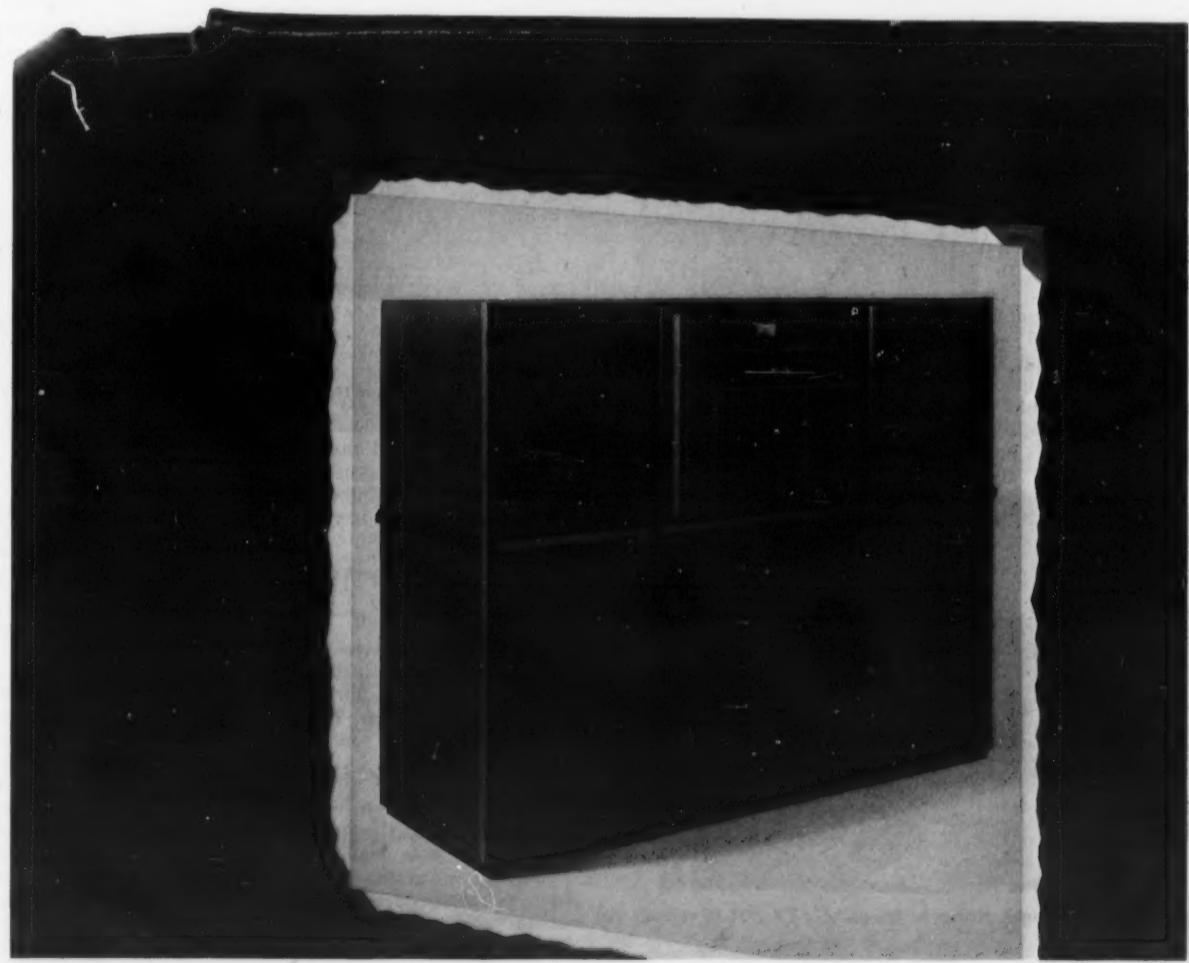
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AT&T demonstrates its Picturephone.

Dedicated Data Devotees Delight in New Equipment

LAS VEGAS — Modems, multiplexers, test sets, and an online Picturephone/CPU demonstration were available to please dedicated data communication devotees attending the FJCC.

AT&T linked several Picturephone sets on the exhibit floor with Alcoa's Picturephone Remote Information System (Apris) to access data stored in a 370/165 in Pittsburgh.

In a demonstration of the system, information on the number of aluminum cans manufactured and shipped for the last year was first listed and then graphed on the screen of a Picturephone display unit. A special circuit was set up by Bell Labs for the AT&T exhibit, and two conditioned 3002 private lines were patched together for the demonstration, a spokesman said.

The Picturephone service is available in downtown Chicago and Pittsburgh and for in-house use in California. Remote access of the type used at the show is not yet tariffed, an AT&T spokesman said. Alcoa currently has six of the telephone display units operating as part of its management information system [CW, April 7].

A time division multiplexer (TDM) that is said to be less costly than frequency division multiplexers in some configurations was introduced by Timeplex, Inc. Designated the T-16, the unit has a "preliminary diagnostic" capability to tell the user via an LED display the status of his data line.

In a 10-channel configuration, the T-16 is priced at about \$10/mo/channel while an earlier Timeplex FDM multiplexer costs about \$25/mo/channel, according to a company spokesman. A four-channel TDM unit with modem is priced at about

\$855/channel, the firm said. Codex displayed its 9,600 bit/sec data modem that is designed to operate on voice-grade private lines. The unit includes a rate switch which also allows the user to transmit at 7,200 or 4,800 bit/sec. A set of operation indicators monitor such functions as data rate, carrier loss, marginal circuit, and test. The Codex 9600 is priced at \$11,500.

The company also introduced its 800 time division multiplexer which can handle up to eight channels of synchronous data at mixed speeds up to 19,200 bit/sec total capacity. The unit is priced at \$350/channel. Both Codex units are available on 90 day delivery schedules.

International Communications Corp. displayed its model 220 transmission test set which is designed to serve both the sophisticated and first time data user, according to a spokesman. The test set can operate with Milgo modems, Bell 301 and 303 data sets and EIA or CCITT-compatible units. The 220 is priced at \$1,650 and first deliveries are scheduled for the first quarter of 1972.

Sangamo introduced its TA 201 2,000/2,400 bit/sec modem which is compatible with Bell 201 data sets. The unit is half the size and half the price of the earlier T 201 modem. The new TA 201 costs "less than \$1,500," a spokesman said. The earlier model costs \$2,300. The drop in size was due to a shift from discrete components to integrated circuit boards, the firm said. The TA 201 will be available in two months.

Other companies exhibiting data equipment included Comdata, Ultrronics, Lenkurt, Penril, and Paradyne.



Dave McDonald, right, brings in Sangamo's TA 201 to replace the T 201.

Joint 'Veterans' View Progress, Urge DP Community Onward

By Edward J. Bride

Of the CW Staff

LAS VEGAS — Computer manufacturers should be prohibited from the leasing business because they have a vested interest in maintaining current systems in the field, and not in advancing technology, according to one FJCC speaker.

Brian W. Pollard, a participant in the first joint computer conference 20 years ago and a director of RCA's computer lab (until just a few days ago, according to moderator Warren King), said users should have the opportunity to have state-of-the-art equipment, but manufacturer leasing inhibits this possibility.

The often suggested approach to breaking up the huge corporations like IBM is "artificial" because it would not benefit the computer users, Pollard said. Instead, he claimed, prohibiting leasing by computer manufacturers would "bring the computer industry more into line with other major industries."

Pollard was one of four speakers on a panel comprised of participants in the first JCC in 1951. The panelists discussed early projections of computer technicians, as well as disappointments and the fruition of their imaginations.

Dr. Liston Tatum, president of KRCA of New Canaan, Conn., said that 20 years ago a major concern of customers and employees was, "Is this outfit in the computer business for the long haul?"

The questions might "still" have relevance, he noted, in deference to Pollard's association with RCA.

Tatum said computer modeling in 1951 was seen as a puzzle: "How nice it would be if the problems of men and society had as few variables as those of bridge design."

Computer people showed a "lack of loyalty" or company spirit then, Tatum added. The oil industry, he said, had a strong tradition of being a "Shell man" or an "Esso man," and couldn't understand how anyone could consider himself a "computer man."

Another aspect of the "people problem" in computer firms, Tatum said, was that a marketing department would buy and sell under the laws of supply and demand, "but the computer department was supposed to hire people using a salary scale based on education, years of experience, and so on. How many organizations still do it this way?" he asked.

"It's a poor substitute for management," he added. "It perpetuates mediocrity."

Regarding the conference theme, Tatum claimed computers do not enhance "the quality of life." He said such applications as computer-written form letters and gasoline credit are not positive influences on life quality.

"The style of life has improved," he noted, acknowledging ticket-issuing systems and other less serious aspects, "but mostly for computer people."

Addressing the "disappointments" topics more seriously, Tatum asked, "aside from the Apollo program, which makes all of us hold our heads higher, and education, what else can we point to?" that proves computers have improved the quality of life.

Dominated Industry

To support the non-manufacturing leasing industry, Pollard said the current system, "particularly in a uniquely dominated industry," results in "new product announcements being determined by profitability studies in which depreciation" is the major factor.

A different, and perhaps proper approach, would be to obsolete, "by a better product, that which has already been sold," he said.

"Unless positive steps are taken," he cautioned, "our industry will finally lose the dynamic characteristic it has had during the past 20 years — a characteristic which has been steadily diminishing."

Other Comparisons

The session, which included general discussions of the first joint conference in Philadelphia 20 years ago, also featured some comparisons of computer progress: error detection, plug-in diagnostics, cost reduction by "low level repair in the field," and training reduction.

Pollard said the fact that average system repair

time had not improved was a credit to the industry, in view of increased computer complexity, but this situation must improve further because of real-time needs of computer users.

Systems should be designed "not redundantly," but with alternate courses of operation, so that unit failure does not cause major system shutdowns, he suggested.

In deeper support of his position on leasing, Pollard noted hardware manufacturers could limit downgrading by larger system users by restricting memory on new systems. A long lead time for new systems is another such device used by manufacturers who also lease, he said.

A General Electric official, and the president of Mitre Corp., both participants in the first JCC, had to cancel their participation in the session because of "uncontrollable" factors, moderator King said.

Six other participants in that first JCC were in the audience, which totaled about 500. The session was one of the best-attended.

Herman Goldstine discussed the "reminiscence" aspect of the 20-year session, concentrating on the relatively small memories, slow speeds, and unsophisticated programming languages of the first computers.

He considered machine language programming "ancient," and said the "rich languages" now are "the single achievement" for pride in the computer community. The proliferation of office terminals was another positive development, he noted.

"The computer has changed our way of life more than any revolution since the industrial revolution," he commented, "and that is only beginning."

Twenty years ago, only about six colleges had computers, and now "virtually every university" and many public schools provide detailed DP instruction.

The role of the computer in social sciences is "in its infancy today," Goldstine said, adding that computers are "great tools to explore social change without social upheavals."

It is Goldstine's "opinion" that a challenge exists to the legal community to "assure protection" of privacy and data bank accuracy, "without hindering" beneficial computer applications such as law enforcement.

After the formal presentations, Goldstine took issue with one statement by Tatum that computers had "not made a helluva difference" in the quality of life.

Goldstine said computers had "profoundly" changed life in such medical areas as biochemistry, and in the "social milieu." As an example, he said a computer model of ambulance locations had led to building of "satellite" garages, resulting in more effective ambulance coverage in the New York area.

A tape recording of the entire session was made, and will become part of computer history.

Security Problems Viewed

(Continued from Page 4)

At the session John Carroll of the University of Western Ontario outlined a generalized information retrieval system that incorporates a multi-dimensional security program.

The multi-dimensional aspect of the system comes from the fact that password or passwords assigned to users determine:

- "Which subset of ten available processing functions they can exercise (level one protection)
- "On which portions of records they can exercise these functions (level two protection)
- "Which records they are privileged to work with or conversely which records are locked against them (level three protection)."

Data protection is provided at levels two and three, he said. Associated with each item name is a protection code which applies to the particular item in all records so that specific items can be protected, he added.

In another paper, Lance J. Hoffman of the University of California at Berkeley described a system wherein access controls over sensitive data is based on sets of procedures called formularies.

In the system "the decision on whether a user can read, write, update, etc., data is controlled by programs (not merely bits or tables of data) which can be completely independent of the contents or location of raw data in the data base," he said.

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Arthur G. Anderson (CW Photos by Farmer)



Self-Justification or a Search For Quality of Life: Anderson

By a CW Staff Writer

LAS VEGAS — Keynoting FJCC, IBM vice-president Arthur G. Anderson encouraged his listeners to evaluate the conference in terms of its effect on the

quality of human life. "Are the papers discussions of technicians in search of an application and self-justification?" Anderson asked, "or are they discussions of man in search for the quality of life?"

Anderson, who has just completed a year's sabbatical at the Center for the Study of Democratic Institutions in Santa Barbara, Calif., holds a Ph.D. in physics from New York University. He is IBM's director of technical assessment.

The main theme of Anderson's talk was that the individual's demand for a better life is rising dramatically, and that ways will have to be found to meet this demand. He carefully noted that this demand comes from both the affluent, educated segment of the population, and from the underprivileged, poor, and repressed as well.

He noted a conflict of interpretation of the term "quality of life." To the poor, interested in jobs, income, and opportunity, quality of life has a radically different meaning than it does to the wealthy, interested in preserving comfort and advantage.

These two sets of needs must be reconciled, Anderson said.

Demand for a better life is growing because of three factors, the vice-president stated. First, there has been an "unprecedented growth in personal freedom" in the last 20 years. "The black, the Chicano, the Indian, the woman, the young — you and I — all are seeking and winning more personal freedom and right to choose on a scale which

is new, dramatic, and spreading," he said.

The second cause is a "great growth of awareness." Growing communications systems and "sensory and analysis systems" are giving people more information on what is affecting their lives than they have ever had before, Anderson said. For the first time, masses of people can see the effects of pollution, the harm of technology, and the failure of institutions, such as prisons that brutalize rather than rehabilitate.

"We have become aware in ways we never imagined," he said.

The third factor, he claimed, is "the growth of responsibility and the demand for alternatives."

Because we are an affluent nation, we can afford to reduce pollution, control oil drilling, or establish a dialog between the institutions of government, education, medicine, and business.

Anderson said that he believes the future holds the promise of continuing betterment of the quality of life — with luck, effort, and sacrifice. One of the major changes he foresaw was in the nature of work.

Multiple careers will become more common, he said, and the nature of work will conform more and more to the expectations of highly educated and independent workers seeking self-fulfillment and greater self-management.

As for computers, Anderson said, "Our industry has no need to be apologetic about the contributions it has made to our national life." He said that pride in accomplishment in the computer industry needs to be tempered with an awareness of the impact of applications on individuals.

Designers of new applications must ask if their ideas are well thought out and if the applications will truly enrich man.

He noted that the technical capabilities of the computer industry are continuing to grow, but said that new uses of computers should relieve individuals from "demeaning drudgery," enrich the working life, teach, provide opportunities for self-development, and fulfill a socially useful function.

Unless these needs are met, Anderson said, if applications are "designed in a way which alienates the user, we're in trouble. In my judgment," he continued, "we will see more and more pressure exerted from outside and more and more effort required on our part to design our applications to the emotional comfort and well being of their users."

Too Expensive to Run

Medical Systems Financial Drag

By Ronald A. Frank

Of the CW Staff

LAS VEGAS — Despite many trial programs, not one clinically-oriented medical computer system is currently paying its own way. And current costs of data retrieval are "much larger" than the value of the data recovered.

This disappointing appraisal was made by Dr. Brad Hisey at a FJCC panel dealing with computers in medicine. When an effective medical recording system is developed, it will probably cost patients about \$10/year, Hisey, a medical computer consultant from Saratoga, Calif., predicted. Most of the several hundred medical DP persons attending the session indicated they would pay such a fee, when Hisey asked for a show of hands.

In order to be cost effective for a hospital, a medical reporting system must be able to break even in 12 to 18 months, according to Dr. Baldwin Lamson, director of UCLA's hospitals and clinics. There is currently a wasteful duplication of effort in the area of administrative patient data, Lamson said.

As an example, he cited the 500,000 patient records maintained by his hospitals. Much of the data accumulated by UCLA is duplicated at institutions in San Francisco and San Diego and other hospitals, Lamson said. Adding to the problem are different patient ID numbering schemes used by Blue Cross, hospitals and other medical organizations, he said.

On a more optimistic note, Lamson predicted that the computer will eventually prove to be better than current "hard copy" systems for keeping track of patient records. An individual's medical records are now "strewn through hospitals, doctors' offices, and insurance companies," Lamson said.

Apparently computerized hospital systems that combine clinical data with management and administrative information will be the first types to become profitable. The panel members agreed that "fiscal data" would help to make medical systems cost effective. In this category some hospitals in the 250 to 450 bed range are close to making their computerized patient rec-

ord systems pay for themselves, the panel agreed.

One major area of concern to the attendees at the session was the question of maintaining the privacy of patient records. In response to a question from the floor asking whether computerized records are "worth giving up a patient's privacy," Lamson said that computerized systems could help to limit access to information if they are implemented correctly.

Although a patient's medical history is legally the property of the hospital, records cannot be released without the approval of the patient, Hisey said. This principle would have to be carried over into any computerized system with adequate built-in protection, he said.

Asked who would be to blame if incorrect clinical information were stored in a CPU, Dr. Charles Post of the U.S. Department of Health, Education, and Welfare said that when a doctor enters a patient's history into the computer, he would have to "sign off" and be responsible for the data.

Users Prime Factor in Interactive Design

By a CW Staff Writer

LAS VEGAS — Interactive systems must be designed around the needs and predilections of their users, according to five members of an FJCC panel on the interface of humans and interactive search systems.

All five were connected with the development of systems in various areas. Donald Walker described the Shoebox system, being developed by the Mitre Corp., for the management of files containing large amounts of text. Walker listed the capabilities such a system needs: it must let the user browse, make notes, make corrections and digressive comments and additions, make extracts, save information, share files, and reorganize structures.

Mitre's Shoebox system allows users to create synonymous titles for files, address files with terms like Last File or All Files, and mark passages with a func-

tion called Finger.

The Stanford Research Institute's Douglas Englebart described a system he has been developing for the last eight years to aid team efforts. The SRI system, using interactive graphic terminals, provides a means of communication between team members in several elegant and complex ways, and also serves as a central library.

The purpose of the system, Englebart said, is to serve as an "intellectual workshop."

Interactive systems for U.S. Congressmen are subject to several unusual constraints, according to Kenneth Hunter of the General Accounting Office.

Legislators are very sensitive to embarrassment; when a constituent is looking on, a Congressman would be loathe to make a fool of himself at a terminal,

Hunter said. The systems, therefore, had to be — as it were — foolproof. In addition, the infor-

mation that would come into a legislative data base would likely originate in the Executive branch, and not really be owned by, or might not be accessible to, the Congress.

The information might well be contradictory and incomplete. The source of information in politics is often as important as the information itself, Hunter said, and the data base has to be designed around this fact.

Michael Scott Morton of MIT's Sloan School of Management talked of his research into the use of conversation data processing in management. Search, he said, is only one part of the decision making process.

He described the efforts of the trust department of a large bank to improve its performance. Through a winnowing process, analysts finally determined that the critical decision area was with the individual portfolio managers, each of whom man-

aged about \$200 million. They then concentrated on ways to help the managers make their investment decisions.

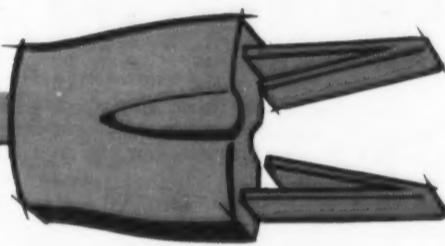
R.V. Katter of Systems Development Corp. spoke of a system designed to provide medical library facilities to remote users. His statements, though, were concerned more generally with the tradeoffs between providing flexibility and power, and providing low cost service.

Users, he said, will stop using a system if response time is long, if the data in the base is poor, or if the data is not presented in a useful manner. Against these requirements, the system designed has to balance line costs, computer costs, and the costs of user time. A truly responsive system, Katter said, gives a user just the information he needs, in a useful format, as quickly as possible.

It also provides the user with the most current information available.

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Editorial

Source Data Entry

Newsmen generally are "quick and dirty" typists who pencil in corrections before submitting their copy. As a result, they are generally unable to type letters and other documents which must be "perfect."

This trait doomed to failure at least one attempt to have newsmen punch their stories onto paper tape. The resulting tapes were just too full of errors. Complicated correction tapes had to be punched by expert typists before the tapes were fed into a computer for typesetting.

The Associated Press has bypassed this problem by replacing typewriters with CRT terminals that enable newsmen, with a minimum of effort, to correct their copy before sending it on its way. And, to the surprise of many people, the newsmen love the terminals.

We suspect the world is full of so-so typists who could file their own "letter perfect" reports, orders, etc. if they had access to a CRT terminal.

Letters to the Editor

Pen Seen Mightier Than a Phone Call

The prompt response of Joseph T. Foster, public relations director of Diners Club, to the article by Alan Taylor indicating his deduction as to why Diners Club had used a blue ink for most of the fixed data and the box headings was most interesting.

Foster suggested if Taylor had called his office, he would have found out the facts, [CW, Nov 3]. But my question is: had Taylor called, would Diners Club have agreed, on the basis of one phone call, to have changed the present blue to a blue that can be photocopied by any type of copying equipment?

Robert Kahn

Robert Kahn and Associates
Lafayette, Calif.

Does Calling Operators 'Girls' Imply Low Pay?

I have enjoyed your series on keypunch replacement [CW, October]. I find it hard to believe, though, that the users you interviewed so consistently referred to their female employees as "girls." Was this really the term they all used or was this "editorialized" in for consistency by your staff?

To a female in the data processing profession, you must realize that this manner of speech is quite repugnant. It infers that all female employees are childlike and immature. Or perhaps the interviewed users' pay scales for these positions are so low that the use of the term "girl" is used to denote Webster's second definition: female servant.

Jeanne L. Seabaugh
Data Processing Instructor
Johnson County Community College
Shawnee Mission, Kan.

No such change was made in the verbatim transcript. Ed.

Watch Those Fortunes!

Is it really fair that a data processor should find the following message in a fortune cookie? "A document that you need may be missing for a while."

William R. Thornton, CDP
Corporate Data Processing
Los Angeles, Calif.



'Er - How Much for Just the Wheels?'

Need Charges Vary With Execution?

By Ronald E. Jeffries

Special to Computerworld

Alan Taylor has drawn some strong conclusions on computer resource charging [CW, Nov. 3]. Paraphrased, some of these conclusions are:

- The user's bill should vary dynamically from execution to execution, depending on the effects of excessive system overhead, or increased effectiveness of resource utilization.
- Elapsed time as a measure of resource utilization is too variable, and thus impractical to use.
- The only remaining way to handle (dedicated) I/O charging is by I/O counts, which leads to grossly unfair hourly rates.

Taylor has done an adequate job of stating the problem of equitable resource charging, though one could perhaps take issue with his logic at some points. It is more useful, however, to go beyond the problem definition and present a viable solution to Taylor's dilemma.

As a basic premise the user is right. If he wants a constant bill, he should get it. His reasoning is simple and valid. "Why," he asks his vendor, "should I have to pay for your inefficient day-to-day allocation of system resources?"

This question is considered from the point of view of an on-line computer operation whether provided commercially or in-house, on a profit and loss basis.

Since the notion of making variable charging the rule of the day has been dismissed, techniques have been developed for obtaining constant job costs in a multi-programming environment.

The basic approach is to break down the system into individual resources, and to attempt to recover a *revenue target* (cost times profit factor) for each resource, from its own utilization.

Rough tuning of the price structure is performed by allowing the profit factor to vary within some range if the resulting unit costing is not competitive. With a well-balanced system, only minor tuning should be required.

Two Kinds of Resources

There are two basic kinds of resources to consider, *count* resources, like CPU usage or file accesses, and *timed* resources, like file storage, core memory, dedicated I/O device time, or connect time. Count resources will be discussed first.

File access charges ought to be priced to pay for the I/O channel and file controller.

Suppose that the revenue target for channel and controller is \$6,000/mo, and that 50% utilization during a 10-hour

business day is expected. (That is, that the file is actually seeking or accessing data 50% of the time). Assuming 20 business days per month, the charge would be \$6,000/(20X10) or \$30/hr.

But an access charge is sought. With average access of 100 msec, the file can do 36,000 access/hr, but 50% usage or 18,000 access/hr is expected. That comes to .16 cent/access.

Probably the most important count resource is CPU. On most systems, CPU

Rebuttal

charges can vary because CPU is treated as a timed resource, based on elapsed time from start of execution to termination, for each time-slice received.

Unfortunately, the density of I/O interrupts can easily cause up to 10% variation, while real-time clock resolution can cause significant errors for small slices.

True Count Resource

The solution is to actually convert CPU execution to a true count resource. This is done by installing a special hardware instruction cycle counter. The counter should count all instructions executed when the processor is not operating on an interrupt.

Each system will require some analysis to determine which states will cause the counter to run and when it should be disabled. My company has installed such a device on one, and finds that it reduces variance to under 0.1%.

Once all the count resources are priced, it is common practice to convert them all to a common base, typically CPU time, and to call them resource units. This allows the user to determine a measure of his usage without reams of arithmetic.

For program development, a system should provide a breakdown of the number of resource units due to CPU, file access, page demands, and so on.

But what about timed resources? Taylor points out that the use of elapsed time is unfair for these, because elapsed time varies with load for which the user is not responsible. This is correct. There is, however, a solution.

One timed resource, on-line file storage, can fairly be billed on elapsed time, if it is always on-line. Then utilization ratios will provide a daily storage rate quite readily. But what of the other timed resources?

Connect time, if properly priced, would be related to the cost of communications

hardware, network, and to the inherent system overhead of having an inactive user logged in.

Productive Terminal Time

A new form of connect time, Productive Terminal Time (PTT), is defined as the elapsed time during which a user is connected, less the elapsed time that the customer spends waiting for system delays.

Since operating ratios for all count resources have been set, one need only decide what minimum percentage of the system to give each simultaneous user, such as 10%.

Then if a program uses one second of CPU (or its equivalent in other resources), it will be billed for 10 seconds of PTT, even if the system requires more than 10 seconds to provide it.

The expected response time for the system has been essentially defined, and the user is not charged for poorer response than that target. Naturally, the user accrues PTT in sync with elapsed time if the system is waiting for him to type, or is sending output to his terminal.

The creation of PTT, which serves as an unvarying idealized elapsed time, solves the timed resources problem completely. Core memory page-seconds are collected in PTT seconds rather than elapsed time. Dedicated I/O device time is handled the same way.

The net result is that the service takes the responsibility for selecting its operating points and meeting them. Everyone is happy; the user has predictable, unvarying costs, the company has predictable income, and the programmers have material performance goals, which management wants.

Each system resource is priced to pay for itself, making justification of additional hardware simpler and more direct.

Naturally there are further considerations. Non-prime-time usage will imply a change in the PTT/elapsed ratio, and may set a lower rate for the resource unit at off hours, or for low-priority runs.

Marketing considerations may dictate volume discounts or low-usage premiums. But all these modifications fit very cleanly into the original scheme, and enable a company to provide load independent, equitable and competitive pricing, with benefit to the company and user.

Why don't on-line services companies do this? One does.

R.E. Jeffries is vice-president, research and development, at Com-Share, Inc., Ann Arbor, Mich.

Scandal of Dead-Track Tapes

One of the data processing areas that has excited interest recently is the problem of tape errors. In an article [CW, Nov. 10] M.L. Stiefel noted that the new Ampex tape controller (which like the Storage Technology Corp. (STC) unit and the IBM 3803 is a stored program controller) can correct up to six errors per block, across all tracks, before indicating an error to the operator.

He also noted that STC's controller can detect and correct errors on a byte-by-byte basis regardless of errors already detected on the track. The IBM system, he said, can only correct one error per block.

This comparison is correct as far as it goes—but there is a great deal more that needs saying.

Originally, in the days of (IBM) Non-Return to Zero (NRZI) type of recording, the data read from a tape was checked by two, independent, logical methods, in addition to the standard electronic checks on amplitude, etc.

An additional parity bit was checked for each character, and also a cyclic check character was appended to the end of each tape record.

Data was not released to the user unless both of these independent checks agreed. The only exception was when a character (or a number of characters) in a block failed the parity checks, and the combination of the two check characteristics (the parity, and the cyclic character) were able to claim a confirmed reconstruction of the original data.

Unfortunately, when this happened, neither the programmer nor the operator was notified such a reconstruction was taking place, and the system opened the door to the occurrence of undetected errors.

PE Relies on Parity Check

When Phase Encoding (PE) came in, the cyclic check characters were dropped and the PE system relied just on parity bits.

The coding method was claimed to be more "reliable" mainly because the strength (amplitude) of the signal was not nearly as important as it had been.

Typically, for instance, signals that have lost 85% of the normal amplitude are regarded as just as strong as full signals. A signal is not regarded as "lost" until 90% has vanished.

"Correctable" parity errors are defined differently on different systems, with IBM regarding weak signals on a single track as being correctable.

Dead Track

When a parity error was noted during the read, the circuitry was checked to see if one of the signals somewhere in the immediate area (timing constraints prevented identification of the

particular character) was falling between the 85% loss and the 90% loss parameter.

If it was, the assumption was made that this track would be dangerous to read for the rest of the block. It was considered as "dead track."

Data on the track would then be ignored, and data on the parity track, properly massaged, would replace the dead track data.

Not Parity Checked

All data in the rest of the block was being allowed into the system without being parity checked.

In fact the "parity" track was treated as a spare track to be called in when a parity error was detected. Its function was simply to replace the original data on the track. An illegal character with even parity would be read as an artificially created character, right into the system with no warning to the programmer, operator, or anyone else!

Ampex Delays Dead-Tracking

The Ampex system counts the errors on each track. It treats the characters one-by-one and permits them to be error corrected on a character-by-character basis using the parity check, so long as no track has accumulated more than six parity errors.

In detecting these correctable parity errors, like the IBM system, Ampex uses electrical rather than logical characteristics.

Ampex does, however, start using the "dangerous" dead track technique if more than six errors are noted on a particular track.

STC Avoids Dead-Tracking

The STC technique does not use the dead track. It ensures signal strengths by electrical techniques and determines character-by-character which signals

to ignore or trust.

Comparison of Three Methods

I prefer the STC method. As I understand it, every character received in storage will have been checked for parity.

Corrections will take place only when a specific bit within a character has been electrically questioned, and replaced.

When all the characters were regarded as reliable but a parity error condition was still indicated, the record would be reported as erroneous.

Re-reading—rather than reconstruction—would then be attempted.

The Ampex system in many ways has the same characteristics, at least until six errors have been found on a particular track.

But with current recording densities, six errors can occur within a small area of tape.

When dead track conditions start all bets are off and an unknown number of characters are read without parity checks.

IBM System Worst

The IBM system, used by the 2400, 2420, and the new 3420 tape drives, is clearly the worst. It leaves the programmer at the mercy of the engineer who

Alan Taylor, consultant, writer, and former editor of *Computerworld*, is president of Computer Management Aids Corp. of Framingham, Mass.

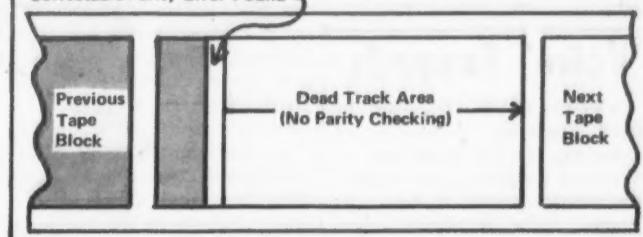
implies data is being protected by parity checking.

The danger is in the number of characters read while the dead track signal is on—because they are unchecked and can be incorrect. The IBM technique maximizes the danger by dead tracking after detecting a single parity error.

The technique of never reporting blocks that have contained

How Unchecked Data Can Be Read Into a Computer

Correctable Parity Error Found



The diagram illustrates what happens when dead tracking occurs. Based on the action of IBM systems using Phase Encoding, the dead track area starts immediately after a correctable parity error has been found. The rest of the block is then read without parity checking, and the parity track is used instead of the now ignored data track.

errors and have been dead-tracked shakes me in its implications.

It does not justify IBM's statement that its tape units use parity checking. IBM must also explain that an unknown proportion of the tape read is *not* parity checked.

Professional Questions

I think there are a number of questions raised here for all computer professionals. A salesman may not want to bring out the weak points of a particular system—but a computer professional certainly needs to know more about what is going on than he previously has known.

The user needs to know the how and why of dead track conditions. It certainly is not adequate to say that because a "reconstruction" has taken place he can be left ignorant.

He must also be able to determine exactly what the problems are, since there can be three

separate causes of error—tape units supplier, tape supplier, and operator.

Summary

Tape systems, such as those from STC and Ampex, make professional users, as well as manufacturers, look at things in new ways.

In this case, the improved error checking capabilities offered by non-IBM suppliers mean not merely that performance and price can be improved outside IBM, but also reliability.

But it also means that computer professionals must start playing an active part in setting up professional standards.

Your assistance will speed the improvements we all need.

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GTE INFORMATION SYSTEMS

Deadline for Interns Extended

MONTVALE, N.J. — The deadline for applying for appointment as a computer intern has been extended until Dec. 15 by the American Federation of Information Processing Societies (Afips).

'Voice' Expands

IRVINE, Calif. — Dr. Paul D. Ellis, assistant professor of chemistry at the University of Southern California, has become the 700th member of Voice, the Varian Data Machines' users group.

The group is two years old.

Dr. Vladimir Slamecka, director of the School of Information and Computer Science at the Georgia Institute of Technology has been named chairman of the Afips Internship Program. He replaces Dr. Anthony Ralston of the State University of New York, who is on a year's sabbatical.

Slamecka noted the program is designed to "assist in the education and application of computer technology in developing countries."

The program consists of a num-

ber of grants covering transportation costs for candidates to serve for one year at an institution or university in a nation whose computing technology "is still in the developmental stage," he commented.

The program is open to persons holding advanced degrees in computer science or to individuals with substantial practical experience in computing.

Host institutions provide local salaries "appropriate to the background and experience" of candidates, Afips said.

societies/user groups

Test Date, Policy Altered By DPMA; Grant Awarded

PARK RIDGE, Ill. — In a flurry of administrative activity, the Data Processing Management Association (DPMA) has rescheduled its business program-

mer exam to the Spring, announced a new policy on publicizing exam grades, awarded a research grant, and had its Canadian chapters form a national institute.

The Certification Council changed the Registered Business Programmer Examination (RBPE) from October to April, with the 1972 test being given April 29. The council said some past applicants had "urged" a Spring exam as "more appropriate than one held in the Fall," which was "too soon after Summer vacations" and left "inadequate time" for preparation.

The council also announced it would disclose percentile rankings of those who sit for both the RBPE and the Certified Data Processor (CDP) examinations. In the past, applicants were notified only whether they passed or failed.

Cutoff scores will not be disclosed under the new policy, which also does not provide for percentile ranking on past exams.

Research Grant

The research grant was awarded to Dennis G. Severance, who is working on a doctorate degree in computer science at the University of Michigan, a spokesman for the DPMA executive committee said.

The association annually sponsors a research grant program for candidates to perform research in preparation for doctoral dissertations in DP systems and management. Severance's topic is "optimal file design for an information retrieval system."

North of the border, the 15 Canadian chapters formed the Canadian DPMA Institute, with headquarters in Toronto. Officials said the intent was to communicate better with federal, provincial, and local governments, and deal with problems of particular concern to Canadian members.

Insurance Users Name President

ATLANTA — Curtis Shankel has been elected president of the Palis Users Group (Pug). Palis is an IBM software package for insurance companies, and is formally known as the property and liability insurance system.

Shankel is systems administrator at the Western Insurance Companies, and assumed the presidency during Pug's recent semi-annual meeting here.

One of the benefits of Pug membership, as described during the fall meeting, was the distribution of a conversion program for users changing from a 2311 to a 2314 disk drive. Central Mutual Insurance Co. markets the program to other Pug users at cost of development.



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November 24, 1971

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Random Notes

Picturephone-CPU Tie Made Through 'Apris'

PITTSBURGH, Pa. — Users located in service areas where the Bell System Picturephone is available can use the device to retrieve data from their IBM 360-370, with the Alcoa Picturephone Remote Information System (Apris) just introduced by the Aluminum Co. of America.

The complete Apris consists of control programs written in PL/1 and in assembler language, and three sample application packages. Installation, maintenance and a user's guide are included in the \$6,000 price.

Apris can be ordered through M.L. Coleman, 1501 Alcoa Bldg., 15219.

Infonet's 'Fires' Forecasts Financial Finesse, Fiascos

LOS ANGELES — Money managers can prepare their reports quickly with the Financial Reporting System (Fires) recently introduced on the Infonet time-sharing network by Computer Sciences Corp.

When working under Fires, the Infonet subscriber also has forecasting and planning capabilities available to him, so that he can project financial, economic, sales and operating data, and test the results of various assumptions.

Infonet service, and the Fires programs, are available in 100 nationwide locations.

Phase 2 Reports Seen Eased By Culprit-based Package

BOSTON — A generalized retrieval and reporting system especially designed for personnel department use, the Personnel EDP Reporter package is available from Cullinane Corp.

Based on the Culprit package previously developed by Cullinane, the new software will provide a means of searching or scanning files for statistical data.

This type of capability is expected to be particularly useful during Phase 2 of the price-wage stabilization effort, when pay increases will probably have to be justified with evidence of productivity increases. The package leases for \$5,000 for a two-year period. Cullinane is at One Boston Place, 02108.

Service Meets Osha Requirements

AMARILLO, Texas — Management Information Systems has enhanced its five-year old Computer Claims Control service so that users can comply with the Occupational Safety and Health Act (Osha) of 1970.

The batch-oriented service is available on individually-negotiated contracts, from Computer Claims Control, P.O. Box 2827, 79102.

CSI Users Shifted to NCSS Net

STAMFORD, Conn. — National CSS, Inc., (NCSS) and Castle & Cooke Computer Systems, Inc., (CSI) have reached an agreement whereby NCSS will provide for the continuation of data processing services to CSI customers.

NCSS will now be providing services in Seattle, Wash., Portland, Ore., and San Diego, Calif., as well as through its offices in Los Angeles, Sunnyvale, and San Francisco, Calif., and other cities across the country.

National CSS's main office is at 460 Summer Street, 06901.

Army Offers Manuals

'Adprep' Eases DP Estimating Effort

By Don Leavitt
Of the CW Staff

ST. LOUIS, Mo. — "Going by the book" should give a user a good forecast of what it takes to develop, operate and maintain any specific DP application — especially if 'the book' is a series of technical bulletins based on the U.S. Army's ADP Resources Estimating Procedures (Adprep).

Adprep was developed to provide estimating standards and a means of updating them in the light of new experience.

A manual system, Adprep utilizes analogies, equations and a set of rules to determine personnel, computer equipment usage, elapsed time and money resources needed for development and continued use of a DP application.

The Adprep concepts are described in four technical bulletins.

The first, TB 18-19-1, introduces the subject of estimating, citing previous methods and outlining the contents of the subsequent Adprep manuals.

Adprep is based primarily on statistical analysis of 38 Army and Air Force ADP systems described in detail in TB 18-19-2. This bulletin also provides a set of indexes so that estimators can selectively retrieve descriptions that are analogous to systems they are proposing to build.

The basic document for Adprep, TB 18-19-3, provides parametric estimating equations developed from the analysis of the Army and Air Force systems.

The use of the equations requires that 12 system characteristics be known or estimated, with a maximum of four used in any one equation.

This manual also includes narrative descriptions of the tasks to be completed within the three phases of a system's life cycle.

It also provides estimating rules to be used as aids to an estimator's judgment.

These rules, which are not based on Army data, may help user's reconcile the estimates derived from the equations and their own experience.

The fourth Adprep manual describes how the Army collects new data to refine the system.

Inquiries about Adprep should be addressed to HQDA (CSSE-IAE), Nassif Bldg., Falls Church, Va., 22041. The technical bulletins can be ordered, probably without cost according to one Army spokesman, from the Army Publications Center, here in St. Louis.

Cybermatics Aids Communications With 'Tin Can' Software, PDP-11

FT. LEE, N.J. — Users can move up to a wide range of communications capabilities with the installation of the turnkey Tin Can product line from Cybermatics.

Coupled with a DEC PDP-11 provided by Cybermatics, Tin Can software allows the system to be used as a controller for an entire communications network in a store-and-forward switching environment.

Otherwise it can be used to collect and distribute data on-line, or as a remote line concentrator.

On-line inquiry systems and systems that apply transactions to large data bases can also be handled by Tin Can.

The basic Tin Can systems handle 64 lines and the company said it "knows of no common-carrier service or terminal arrangement that Tin Can can't work with."

In addition to the DEC hardware and the software needed to interface with the terminal services and to perform the desired functions, Tin Can includes a Real-Time Executive Operating System.

The Tin Cans providing the different capabilities are available off-the-shelf, but will be customized by the company. The simplest system, a data concentrator for 16 lines, costs \$50,000.

The software has not been formally priced as a separate item, but would "probably" be around \$20,000, the company said.

Deluxe systems can handle up to 300 lines. The average turnkey Tin Can system is expected to cost about \$250,000.

Cybermatics is at 2460 Lemoine Ave., 07024.

Sort/Merge Available for Minis

FT. WORTH, Texas — Users of Data General Novas and other 16-bit minis equipped with magnetic tapes, cassettes or disks have an opportunity to do commercial applications, through the use of a generalized sort/merge program now available from Rhombic Research Inc.

Sorting is generally considered one of the fundamental operations in business DP, but Data General has not yet provided its users with this software capability.

The Rhombic package is capable of sorting fixed-length, unblocked records in either binary or Ascii recording mode. It uses the Ascii collating sequence.

Data can be in virtually any code pattern. Fixed- and floating-point numbers are said to present no problem.

Files created by Fortran or assembly language routines can be handled by the Rhombic sort, as long as the individual records are no more than 256 words long.

Designed originally for use on an 8K Nova, the package is available in paper tape or cassette versions for \$995. It will be modified "probably at no additional cost" to operate on any magnetic tape or disk configuration or on any 16-bit computer that supports Fortran, according to a company spokesman.

Rhombic Research Inc. can be reached through P.O. Box 12879, 76116.

Time-Shared Inventory Service Has Bill of Materials Module

CAMBRIDGE, Mass. — A time-shared service that performs all major inventory control functions for small business, I/I from Select Computer Systems Inc., also includes a bill of materials processor.

Data entry is in a simple user-oriented format said to minimize learning time and operator errors.

The data base used by I/I is divided into a series of sorted sequential files which are accessible only to workers authorized by the user.

The company customizes and installs I/I and provides on-site instruction until the system is running to the user's satisfaction for an initial fee of \$5,000. System enhancements are provided without additional cost, according to the firm.

Implemented by the company on a time-sharing network with local dial-up to 16 U.S. cities, the system is said to cost an average of less than \$1,000/mo to use, including terminal rental charges.

Select Computer Systems is at 68 Rogers St., 02142.

Dataroyal Adds New Package

NASHUA, N.H. — Manufacturing and engineering firms with 32K IBM 360s can predict parts and subassembly requirements and develop part and labor costs at any level of manufacturing, with the Bill of Material Processor from Dataroyal Inc., 235 Main Dunstable Road, 03060.

The BMP uses two interactive master files containing parts and product structure information. The system is programmed in RPG and BAL.

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'Pops' Go the Minis

HICKSVILLE, N.Y. — Minicomputer users can compile their programs using high speed disk or tape units and a line printer rather than low speed paper tape readers, by utilizing the Per Data Operating System (Pops) from Peripheral Data Machines Inc. (Per Data).

Pops will be available on a turnkey or bundled basis, including a Data General Nova or DEC PDP-11 and a choice of Per Data peripherals, in January.

By providing fast compilations on the user's own mini, Pops appears to offer another alternative to the use of cross-assemblers, which require the user to move to a full-scale CPU to get the advantage of high speed peripherals.

Besides interfacing with the Per Data peripherals, Pops includes most of the functions available in the operating systems provided by the minimakers.

Although originally designed for a disk-oriented configuration, Pops has been generalized to function with other Per Data peripherals as well. It is also being adapted to minis other than the Nova and PDP-11, company spokesmen said.

Minimum configuration required to use Pops is a 12K 16-bit computer with teletypewriter or CRT display keyboard entry, a line printer and some form of high speed storage, including two magnetic tapes, a fixed head disk device and high speed paper tape unit, or disk packs.

Per Data is at 102 New South Road, 11801.

Software Exchanges Formed to Support Research in Geography, Social Science

Information about software in two separate research areas — Social Sciences and Geography — has been accumulated and is available from clearinghouses recently established at midwestern universities.

The programs held by the Geography Program Exchange (GPE), at Michigan State University, are described as specialized material developed for use in spatial analysis, which is to be made available at cost to universities and other non-profit organizations.

A collection of abstracts, describing software that is available directly from developers, has been published by the Data and Program Library Service for the Social Sciences at the University of Wisconsin.

This effort is sponsored by the National Science Foundation as part of a National Program and Central Program Inventory Service (NPL/CPIS) for social sciences.

Current GPE holdings have been contributed by a

large number of U.S. universities and several European institutions, including the London School of Economics. No attempt has been made to duplicate the contents of standard statistical programs such as IBM's Scientific Subroutine package.

The GPE programs fall generally in the areas of mapping techniques, spatial point pattern analysis, techniques of network analysis, spatial simulation and techniques of surface analysis.

An attempt has been made to provide each of the GPE programs for both IBM 360-370 and CDC 6000-series CPUs, with Fortran as the common language. The packages distributed by GPE include source code and documentation, and test data and test output, when available.

Prof. Robert Wittick of the Computer Institute at Michigan State University, East Lansing, Mich., 48823, is in charge of the GPE operation.

Abstracts Name Sources

The abstracts available through NPL/CPIS at Wisconsin list the function, usage, machine requirements and distribution source of each program. There are currently more than 1,000 abstracts available in the collection.

Most of the NPL/CPIS programs are of a data management and statistical analysis nature, but some other capabilities are included, a spokesman said. The sources listed in the abstracts have agreed to provide the programs in source code and documentation to researchers on a non-profit basis.

The abstracts can be ordered from NPL/CPIS in the Social Science Building at the University of Wisconsin, Madison, Wis., 53706.

Honeywell Programs Vehicle Scheduling

WALTHAM, Mass. — Medium- to large-sized distribution firms supplying a relatively stable base of customers from central warehouses will be able to plan effective delivery routes on a daily basis, with the Vehicle Scheduling System (VSS) software from HIS.

The system matches input from the user's order entry system against a previously-defined data base to sequence delivery points as effectively as possible within known constraints.

The data base includes definitions of the vehicle fleet, and data about physical barriers such as rivers, lakes or mountains. It also carries information about congested areas that restrict travel speeds, and loading/unloading times.

In addition to daily schedules and route sheets, VSS generates management reports and stores daily data on a history file for later summarization and review.

Reports on three levels are available each day. The schedule summary lists delivery information for all routes; the route summary shows total route time, suggested start time, expected return time and vehicle type assigned, by route. The route sheets provide all the working details needed by the vehicle driver.

The daily scheduling phase uses the results of calculations performed during annual file maintenance and network analysis phases. These calculations provide data about savings that would be possible through use of round trips linking several related delivery points.

The system calculates the savings in both distance and time so that the user has a choice of which factor he wants to have optimized during scheduling.

VSS can be used on any HIS Series 200 CPU with 65K characters of memory, two disk packs, and a tape drive. The advanced programming and editing instruction set is also required, the company said.

The system is expected to be available, without cost to users, early in 1972.

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Reference on the Systems Approach A Necessity for Technical Libraries

By A.G. Hanlon

Special to Computerworld

Management Information Systems Handbook, by W. Hartman, H. Matthes, and A. Proeme, McGraw-Hill Book Co., New York, 1968, Six Volumes, \$29.50.

A veritable fountain of information, this extremely detailed tome represents a rather unique reference for those concerned with analysis, requirements determination, design and development, and implementation and evaluation.

The handbook contains six volumes, beginning with a short introductory volume dealing with organizational concepts, purpose, scope and approach to the systems approach of analysis, requirements, design and implementation (Ardi). A brief explanation of the volume subdivision and a listing of the appropriate terminology with definitions is included.

The second volume concerns the management of an information systems effort. Included as subdivisions are facets of organization of the systems effort, project planning and control, costs and benefits.

Volume 3 covers systems analysis and

Book Reviews

design procedures, including problem definition, analysis of the current system, identification of requirements and constraints, and design of the new system.

Development of a subsystem previously described is detailed in Volume 4. Activities enumerated are program requirement specification, procedure and forms specification, data conversion, program development, subsystem testing and user documentation requirements.

Volume 5 continues with the steps required for system implementation and evaluation.

Practical rules for evaluation of the working information system are listed.

High School Texts Work as Lab Manuals

By Paul F. Hultquist

Special to Computerworld

Computer Science: Fortran Language Programming, and *Computer Science: Basic Language Programming*, by Forsythe, Keenan, Organick, and Stenberg, John Wiley and Sons, Inc., New York, 1970, 181 pages, \$4.95 and 124 pages, \$3.95 paperback.

Unlike other programming books now on the market, these texts are not self-contained. They must be used with *Computer Science: A First Course* (or *Computer Science: A Primer* — an abbreviated version) by the same authors. [CW, Oct. 13].

The primary texts develop the main ideas of programming down to the level of algorithms and flowcharts.

The language books, including a PL/I version, pick up their problems from the main texts and develop programs in the appropriate language. An interesting outgrowth of a School Mathematics Study Group experimental course, the series is well done.

These "lab manuals" are devoid of most of the philosophy of computing but are strong on details and the mathematical sophistication of the problems is appropriate to the level of high-school students.

If you want a whole course in what passes for computer science at an elementary level you could do much worse than to use one of these books together with the main text.

If you just want to learn Fortran or Basic programming you might be happier with something else.

Paul F. Hultquist is professor of electrical engineering at the University of Colorado.

Volume 6, "Techniques and Standards," describes management techniques, documentation, data gathering, design and development, control techniques and programming. Included are subactivities of network planning, human engineering, presentation techniques, technical writing, charting techniques and a multitude of other useful reference tools.

Each volume is well indexed for quick reference. In addition a comprehensive subject index is appended, together with a generous bibliography. This handbook has to be the most comprehensive reference of its subject matter written to date.

Its value is not limited to its utility in the development of management information systems, but is equally viable for use in the design and implementation and control of any project or program. A technical information library without this book would be incomplete.

A.G. Hanlon is product manager, NCR, San Diego, Calif.

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FCC Requests One-Year Delay On Private Line Protection

WASHINGTON, D.C. — The Federal Communications Commission has "requested" that AT&T delay for one year its proposed tariff that would require connecting arrangements on private lines. The phone company said it will agree to the postponement.

The request was sent to AT&T in a letter from Bernard Strassburg, Chief of the commission's Common Carrier Bureau. In it Strassburg outlined the specific portions of AT&T's tariff plan that do not comply with FCC regulations.

In particular Strassburg said that the proposed service terminal protection to be applied to private lines with customer-provided data and other equipment

ment "is essentially meaningless in that the tariff nowhere specifies what protection is [to be] provided by the connecting arrangements."

The letter also told AT&T that it had provided "no economic data or information to support [its] filing."

Although Bell has said that the private line protection will be offered free of charge, some users have claimed that eventually someone will have to pay for the changes.

The proposed private line interconnection requirements have been delayed several times. The latest postponement occurred last August when the FCC asked AT&T to defer its plan for 90 days. That extension would have

expired on November 15.

While the regulatory process has been grinding on, users have not been silent. More than seven petitions against the private line protection provisions have been received by the commission.

Asked what would happen if AT&T refused to honor the FCC request, a commission staff spokesman told CW that it probably would have initiated proceedings to consider the users' petitions.

In a reply letter to the FCC, AT&T Vice-President T.W. Scandlyn said that AT&T would comply with the one-year extension even though the carrier does not agree with some of the points raised in Strassburg's letter.

communications

Some AT&T Rates Beat New Carriers, Study Claims

CHICAGO — A study comparing proposed MCI and Datran rates with existing tariffs of AT&T indicate that the Bell System may be competitive in some areas.

The study was undertaken by Berglund Associates who acknowledged that in some cases "an apples and oranges" relationship exists between the type of services that were compared.

Bell's tariff 260 was compared with proposed tariffs supplied by MCI and Datran. The study was aimed solely at a "cost per unit of transmission," according to Ralph Berglund, managing director.

MCI's proposed rates are more expensive than Bell at 4,800 bit/sec above 900 miles and more expensive at all mileages for 9,600 bit/sec transmissions.

Since the cost of terminals and multiplexers was not included in the study, some inaccuracies may exist. MCI services cover both "line" charges and any equipment required for transmission, an MCI spokesman said. The over 900-mile disadvantage may have shown up because Berglund used rates filed for the MCI New York to Chicago route which covers only 740 miles, he added.

MCI has not yet filed national rates for end-to-end service but it has said that it expects to be below AT&T charges on such routes.

In comparing Datran with Bell, Berglund said at 9,600 bit/sec AT&T had an edge "over 275 Mchar./mo at 1,000 miles to 600 Mchar./mo at 3,000 miles."

But according to Datran 3,200 minutes of transmissions at 9,600 bit/sec for 2,000 miles will be priced at \$910. The comparable Bell rate would be "about \$2,000" for a 3002 type private line, Datran said.

The typical Datran user will make a number of random calls of less than one minute to several different termination points," a Datran spokesman said.

Short Distance Transmissions

The study showed that Datran can be cheaper than MCI for low volume short distance transmissions because Datran plans to charge by data volume instead of distance, Berglund said.

The only known comparison between a specialized carrier and AT&T involves MCI's first user [CW, Nov. 10] who will save about 40% compared with existing Bell rates.

Berglund acknowledged that the comparisons were based on tentative tariffs. In addition, the study excluded Bell switched network services, MCI/AT&T trade-offs at 2,400 bit/sec, and possible Datran private line offerings.

Mini with 2,049 Registers Data System Includes 16-bit

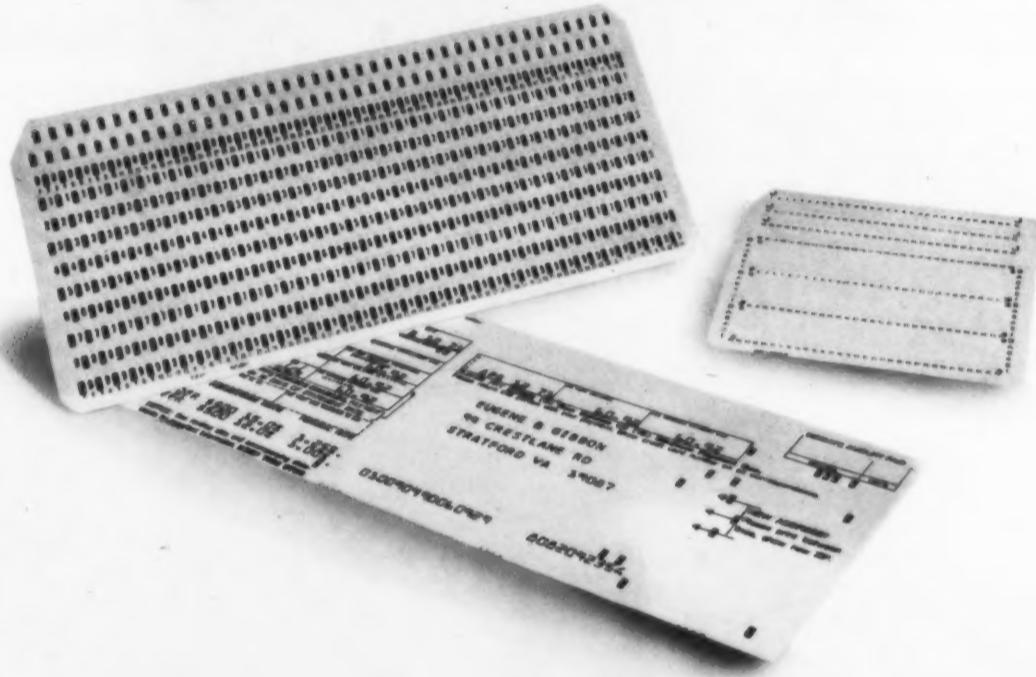
SANTA ANA, Calif. — The Omnis 1/C communications system includes a 16-bit mini that has 2,049 registers and a possible instruction set of 500. The mini has a maximum storage of 65K bytes and it is used as the 1/C controller.

The system can accommodate up to 192 full duplex synchronous or asynchronous peripheral devices at rates up to 9,600 bit/sec. It can interface with an IBM 360 system, according to a spokesman.

The 1/C can be used in time-sharing applications for both in-house and data-oriented networks. The system is supplied with hardware only and the user must develop his own software depending on the application.

A maximum configuration with 192 channel capability is priced at \$60,000 without maintenance. The system is scheduled for first deliveries in the first quarter of 1972. Omnis Computer Corp. is at 1538 East Chestnut St., 92701.

System/3 users:



Now you can get a reader that reads more kinds of cards, and reads them faster, than the one you're using—for half the price.

That's about \$200 or so a month, rather than \$500 and more.

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The new Bridge Data 8803 System/3-matched Multiple Card Reader, a simpler, faster, more versatile—and cheaper—way to get into your System/3.

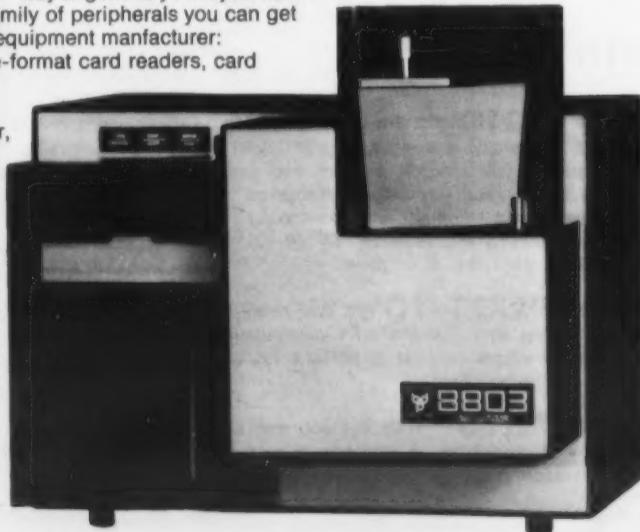
And it's just one of a complete family of peripherals you can get from Bridge Data, the very original equipment manufacturer: single-format card readers, multiple-format card readers, card punches, and the like.

Matter of fact, you probably already have used our equipment or, at least, seen it at work—wearing somebody else's name or initials. We've been turning out computer-related electromechanical things, although somewhat anonymously, for over 13 years.

For information on the new 8803, or any of our System/3-compatible peripherals, drop us a line. **Bridge Data Products, Inc.** 738 South 42nd Street, Philadelphia, Pa. 19104.

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It's the first significant answer to the trained operator shortage. Untrained girls learn to enter faster, more accurately, and with less supervision.

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Configure your system any way you need it. As a large multi-purpose peripheral system, as shown here. With keyboards added on to your present System 2400 processor. Or as a dedicated cluster system for volume entry.

With one to twenty keyboards per system.

There's a lot more you want to know about System 2400. Write or call us collect. We'll see that you get the full story.

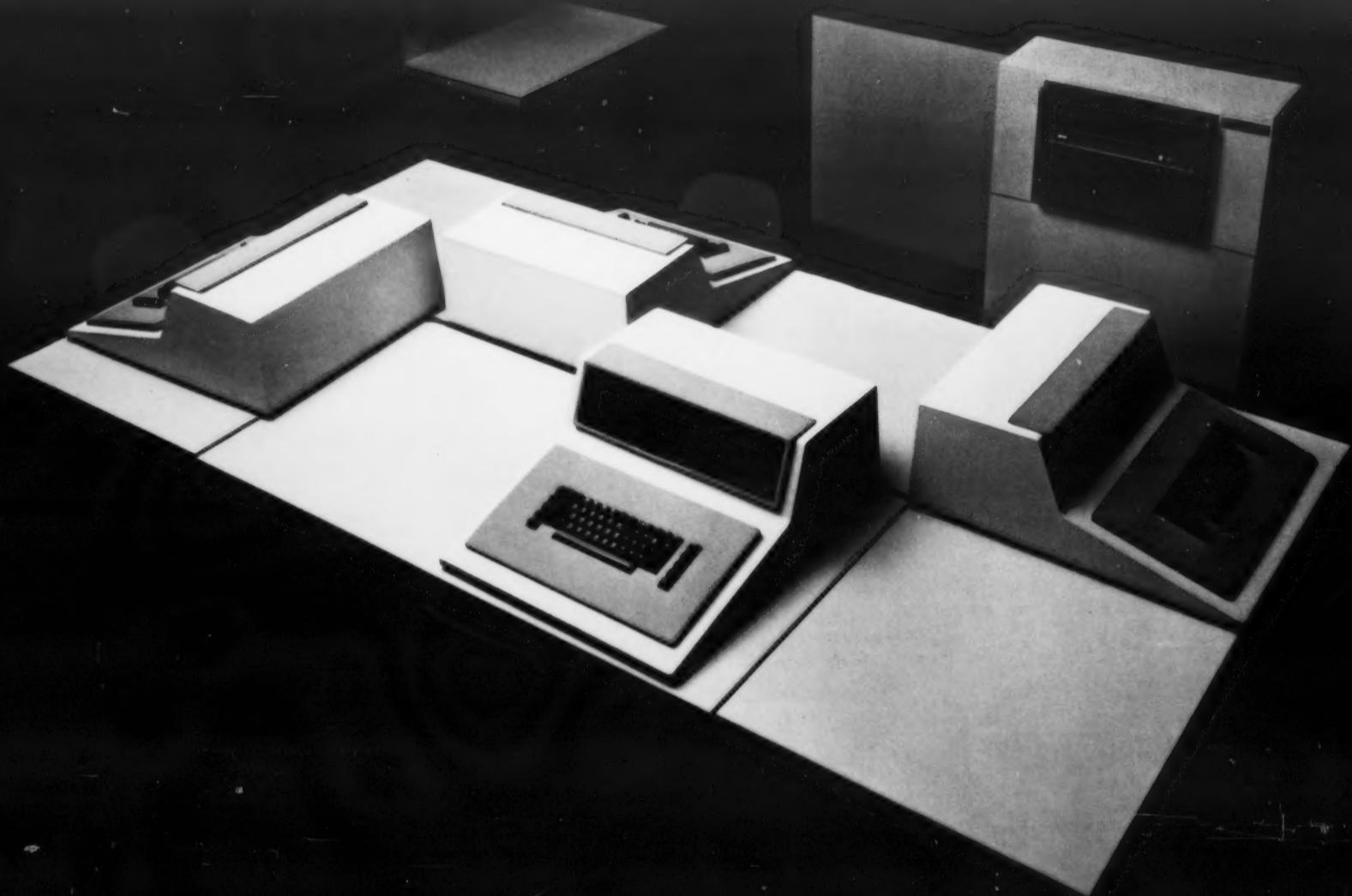
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Bits & Pieces

Caelus CMCX Disk Pack Operates on IBM 3330

LAS VEGAS — Caelus Memories Inc. has introduced a disk pack for use on the IBM 3330 disk drive.

Called the CMCX, the removable unit has 10 recordings disks and is interchangeable with the IBM 3336 pack. The CMCX has a storage capacity of 100 M, 8-bit bytes. It is priced at \$850 and will be available for first delivery in January. Caelus is at 967 Mabury Road, 95133.

Unattended Restart Added To Willard Tape Drives

LOS ANGELES — Willard Laboratories Inc. has added an unattended power fail restart feature for its 7/9 tape drives.

The restart feature, which can be field-installed, allows automatic restart whenever power has dropped below 80 volts. The feature can operate with Willard tape units because of the disk brakes which assure "that no loop of tape will be thrown during power failures," the firm said. The drives are used with Microdata systems, Willard said.

The feature is included in one circuit board and is priced at \$20 from 4221 Redwood Ave., 90066.

Philips Cassette Comes In Ansi or Ecma Versions

LAS VEGAS, Nev. — North American Philips (Norelco) introduced a certified digital cassette at the FJCC, that is available in either Ansi or Ecma versions.

The "professional" cassette includes a metal housing that contains 282 ft. certified to handle 800 bit/in. The cassette will be available in January in a price range between \$5 and \$10, according to a spokesman. Philips is at 100 East 42nd St., N.Y. 10017.

Memory Boosts 360/30 to 128K

NEWTONVILLE, Mass. — Cambridge Memories Inc. has an add-on memory unit for the 360/30 that will increase the storage capacity to 128K bytes, according to the company.

The increase over the 65K capability limit imposed by IBM is said to include "a few [circuit] cards and some minor wiring changes."

A 128K memory unit is priced at \$3,834/mo on a two year lease. Maintenance is extra at 2% of the rental price. The add-on memory does not slow down the CPU or otherwise affect system operation, a spokesman said. The system is available in 90 days from 285 Newtonville Ave., 02160.

COM Camera Speed Increased

SAN DIEGO, Calif. — Stromberg Datagraphix has increased the film throughput of its 4360 Computer-Output-Microfilm (COM) Recorder.

The recorder's camera speed has been increased by about 40% to a rate of one frame every 100 msec. This directly affects the recorder's throughput by increasing it from 10,000 lines of data-per-minute to 15,000 lines, the firm said.

This new feature, which is immediately available on all 4360 production models, will be installed at no charge on 4360 recorders presently at customer sites. The company can be reached through Box 2449, 92112.

Is There a 'Fix'?

Users Irked by S/3 Printer Change

By Ronald A. Frank

Of the CW Staff

WHITE PLAINS, N.Y. — IBM says the System 3 print train needn't stop anymore — but some affected users apparently haven't been told.

Last April IBM began to ship new 3/10s with a feature that caused the 5203 printer train to cycle down after a 30 sec wait period. Previously the print train had run continuously when the system was in operation.

The print train time-out feature was also included as a field installed "fix" on earlier machines, and some System 3 users began to complain. The problem was documented in the current issue of the Nasu (System 3 users) newsletter.

The problem was twofold. First the timing switch on the print train meant

that the CPU had to wait for a five-second run-up cycle every time it wanted to print and the print train was not running. Second, the software would cause the system to hang up every time a printer ready status type instruction came up.

One Dallas user said IBM delivered his 3/10 last month with a special switch that would allow him to run the print chain continuously when desired. The user said that he believed IBM was restoring the continuous run capability to all System 3s where users have had a problem.

When asked to clarify the situation, IBM told CW that a CE field change has been available since July to revert the print train to its constant run operation.

But Irwin Cahan, managing editor of the Nasu Newsletter disagrees. He said his organization met with IBM's Western

Region System 3 specialist in October. The specialist told the user group that IBM was working on a solution to the print train timing problem. He said he thought the time out interval would be changed to 120 sec from 30 sec but added that the change had not yet been released to his knowledge.

The software problem was particularly bad, according to Bill Fletcher, President of El Paso Data Services. Each time his System 3 performed a sort, the operation would hang up on a No Halt or No Log instruction until the print train came up, he said.

"The problem costs us about 10 minutes of unusable CPU time each day," Fletcher said. He estimates that his monthly unproductive CPU time is close

KANSAS CITY, Mo. — One user here has deducted \$50/mo credit from her IBM bill for the print train delay.

"IBM said they were sorry but there was nothing they could do. So we are claiming a credit until this problem is solved," Doris Sawyer president of Keys to Profit Inc. told CW.

She said IBM charged her \$50/mo extra in 1970 to speed up her printer from 100 to 200 line/min. Since the print train problem has cut the throughput by a similar amount she is deducting it from her bill, she said.

to four hours. At \$9.50/hr for CPU time plus \$5.00/hr for the operator, Fletcher says the print train change has cost him up to \$58/mo. IBM had said the change would increase the operating life of the print train.

Only last week both the local IBM branch manager and his engineering manager told Fletcher they knew of no way to correct the problem, the user told CW.

But an IBM spokesman said the company was very much aware that some users were concerned. "Any user can call his local IBM CE to have the print train changed to its former continuous run operation," the IBM spokesman said. "It is a simple change that we can do in the field free of charge," he said.

Three Lower Priced Nova Minis Introduced by Data General

By Frank Pista

Special to Computerworld

NEW YORK — Three new models of Nova minicomputers announced here last week by Data General are lower cost versions of its Nova 1200 and 800 processors. Several features for the Nova line were also introduced.

The three models, the Nova 1210, Nova 1220 and Nova 820, offer performance on a par with the older, more expensive versions and are compatible with them on both a hardware and software level.

The Nova 1210, is the lowest priced, most compact mini yet offered by Data General. Only 5-1/4 in. high, the machine has a cycle time of 1.2 μ sec and can be obtained with 4K to 24K 16-bit words of core.

The Nova 1220 offers greater expansion capabilities with the same performance as the 1210.

The Nova 820 is the fastest of the three new models with a cycle time of 800 nsec. Like the 1220 it can accommodate

up to 32K words of core.

The price of the 1210, with 4K of core is \$4,350, and \$5,750 with 8K words of memory. The 1220 pricing is \$5,250 for the 4K version and \$6,650 with 8K. A 4K 820 sells for \$6,450 and an 8K 820 for \$7,850.

The price reductions involved, in comparison with the Nova 800 and 1200, that are still offered, are considerable. The 1200 with the standard chassis and 4K of core sells for \$5,410, with 8K for \$8,110. The 1200 Jumbo chassis, similar to the 1220, in its 4K version has a selling price of \$6,260 and in its 8K version, of \$8,960. The 800 with 4K of memory sells for \$7,760 and the 8K for \$10,760.

Data General is also offering three other additions for all Nova models. These include a 1K-word bipolar ROM, a 1K word core memory unit, and a tamper-proof front panel for dedicated turnkey operations.

Deliveries of the three new computers will begin in February.

Typewriter Adds Cassette Unit And Data for Terminal Usage

TEWKSBURY, Mass. — Wang Laboratories has added a cassette storage unit to a heavy duty IBM Selectric to develop what it calls a "computerized typewriter."

Called the 1200 system it can justify margins, and perform other typesetting functions in addition to searching for specific lines within a document. Searches are keyed to blocks of characters keyed in by the operator.

A communication capability can be added to allow the 1200 to transmit batched data from cassette storage to an IBM 2741 terminal or equivalent unit.

With the communication feature, the 1200 can transmit data at 135- or 300 bit/sec. It can be used with either an acoustic coupler or a Bell 103A (or equivalent) modem.

The 1210 single cassette unit is priced at \$175/mo and the two cassette unit costs \$225/mo. Purchase is \$7,000 and \$7,400. The data capability adds \$75/mo or \$2,400. Delivery is in six months from 836 North St., 01876.



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Quantor's new 105 microfiche recorder shows you cut, dry microfiche four minutes after you load it with computer output tape. And the blended-dot 7x10 characters look like they were printed on the film.

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Ampex Disk, Memory Systems Designed for Univac CPU Users

By Ronald A. Frank

Of the CW Staff

MARINA DEL REY, Calif. — The Ampex Corp. has introduced plug-compatible disk and memory products for Univac 1100 and 400 series users. The announcement marks Ampex's first attempt to attract Univac users, according to a spokesman.

The Amprand removable disk system, designed to replace the Univac Fastrand II and III fixed drum storage systems, is based on an Ampex controller which interfaces the CPU with the disk drive.

The Amprand II with 22 Mwords of 36-bit data is priced at \$3,850/mo while a comparable Fastrand II from Univac costs \$5,000/mo, according to Ampex. An Amprand III system with 33 Mwords of storage is priced at \$4,700/mo while a Fastrand III costs \$6,045/mo.

Although users may be quoted lower prices on the Fastrand units, an Ampex spokesman said his firm would be able to offer users a 20% savings.

Speed Memory Access

A switch from Fastrand drum storage to Amprand disks will speed up memory accesses in addition to the cost savings. The Fastrand system has an access time of 92 msec while the disk replacement has a 30 msec access time, according to Ampex.

In addition the disk packs are removable as compared with the drum which is a fixed type of storage.

Ampex also announced add-on core memory for 1100 and 400 series CPUs which will save users 20% on both native or added core, according to Ampex. A typical 65K word module for the Univac 1108 system costs

HP Systems Get Data Disc Unit

SUNNYVALE, Calif. — Data Disc Inc. has made available a disk memory system for Hewlett Packard 2114, 2115, and 2116 computer users. The Model 1709 is a high capacity, fast access disk memory peripheral with memory capacity available in five levels from 32K to 524K words. The memory has an average access time of 16.7 msec and a transfer rate of 15 kword/sec.

The system hardware consists of a 7200 series disk memory and power supply and a single card interface controller which plugs into any I/O slot in the computer.

The 1709 is priced from \$5,500. Delivery is 45 to 90 days. Data Disc is at 686 W. Maude Ave., 94086.

NCR Has Portable Ultrafiche Reader

DAYTON, Ohio — A portable upright reader for ultrafiche images has been announced by NCR. Weighing 27 pounds the 455-3 reader takes up less than a square foot of counter or desk space.

The 455-3 is capable of retrieving images reduced 150 times. The new reader sells for \$450.

\$8,325/mo as opposed to a native core price of \$10,440/mo, Ampex said. The ARM-1108 core memory duplicates Univac's 750 nsec cycle time.

Both the Ampex products are available within 90 days.

Fixed Disk System

Univac users who want to switch from Fastrand to disks can enjoy an even larger savings if they decide to use a fixed disk system from Data Products.

First delivered last March, the 7114 disk file comes in a minimum configuration of 44 Mword which is equivalent to two Fastrand II units with controller.

The configuration costs \$4,225/mo compared with the Univac price of \$9,380, according to Data Products. The system has an access time of 70 msec.

Data Products is at 6219 De Soto Ave., Woodland Hills, 91364.

Varian Offers 620 Controller

IRVINE, Calif. — Varian Data Machines has announced a line of controllers designed to connect any Varian 620 minicomputer to peripheral devices by utilizing asynchronous serial interfaces.

Designated Model E-2184, the universal interface comes in three versions, ranging from 40 to 10,000 bit/sec; with 5-, 6-, 7-, or 8 bits including parity; and in cable lengths from 20 ft to one mile. Functionally, all three versions are the same, differing only in electrical interface characteristics.

Typical applications include CRT displays; TTY equipped with RS-232C or current loop interfaces, computer-to-computer direct links; and serial printers, cassettes, and other peripherals.

Operation can be either under program control or in an interrupt mode using Priority Interrupt Module (PIM) option.

The controller is \$600 for immediate delivery from 2722 Michelson Drive, 92664.

We tailor
our
computers
to fit your
business.

TI Offers \$2,850 CPU

HOUSTON — A new 16-bit digital computer with a selling price of \$2,850 has been announced by Texas Instruments Inc. Designated the Model 960A, the device is the latest in the 900 series and has 4K of active-element semiconductor memory with a 750 nsec cycle time.

The dual-mode architecture of the 960A makes it especially appropriate for manufacturing automation, process control and data collection systems applications, TI said.

Included in the price are the power supply, a direct memory access channel, automatic parity checking, memory write protect, and a complete, lockable front panel. Additional 4K memories are \$1,500.

Software packages including Fortran, monitors, loaders, macro processors, an overlay link editor, a disk operating system, and assemblers and cross-assemblers are available. Deliveries begin in late 1971. The firm can be reached through Box 1444, 77001.

Add-On Core Unit Can Upgrade 360/22 To 64K Capacity at \$1,800/mo Savings

LOS ANGELES — Information Control Corp. has introduced an add-on memory for the 360/22. The memory will give 360/22 users the same storage capacity as the 360/30 at a saving of about \$1,800, the company said.

Called the Corpak 22, the memory expands the 360/22 storage from IBM's top limit of 32K up to 64K. The add-on system has the same cycle time as the CPU and in most cases it can be installed "in two to four hours."

The cost savings were quoted by Information Control based on a comparison between a 64K 360/30 and a 360/22 equipped with the Corpak unit. The IBM 360/30 with 64K costs users \$3,870/mo from IBM while a 32K 360/22 is priced at \$1,150/mo.

The Corpak unit to raise a 360/22 up to 64K costs \$900/mo. The total Model 22 system cost for the user would then be \$2,050, according to Information Control.

A Model 22 user could save even more by ordering a 24K 360/22 from IBM and adding a 40K Corpak memory at \$1,100/mo, according to an Information Control spokesman. All monthly prices are for three-year leases. Delivery is about two weeks, a spokesman said.

Maintenance on the Corpak units will be supplied by Sorbus. The memory system is available from 9611 Bellanca Ave., 90045.

Transcom CT-300 Is Low Cost Data Entry System

BLOOMFIELD, Conn. — Transcom has combined its keyboard-equipped strip printer, mag tape cassette unit, and other peripherals with a control unit and modem into a low cost series of data entry terminals said to offer the widest range of configurations in the industry.

The CT-300 series data stations feature modular design that enables the user to tailor his data entry equipment to specific requirements and to expand his system when needed, according to the company.

The series is compatible with WE 103A2 data sets or the equivalent at the receiving end. It interfaces, the company said, to any computer hardware or software capable of communicating with teletypewriters.

The series consists of four standard models. They feature a silent electronic strip printer, numeric or alphanumeric keyboard, modem and mag tape cassette storage.

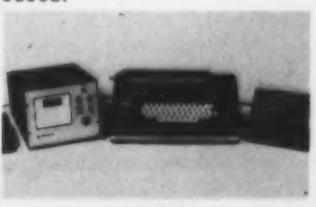
Optional devices include polling, originate/answer, device controls, and acoustic coupling. Originate models offer transmission characteristics similar to a Teletype ASR 33, transmitting 11-bit ASCII code at 10 char./sec.

Polling versions have switch-selectable transmission speeds of 10-, 15- or 30 char./sec. They can recognize a loss of carrier condition as a message recovery command, which disconnects the terminal and executes a rewind to await a second call from the receiving unit.

Send/Receive models contain device controls to provide remote control of the tape cassette.

Several peripherals may be simultaneously controlled. These include a plastic card reader, paper tape reader and paper tape punch.

The CT-300 sells for \$1,825 to \$2,970, depending on model and features. Lease prices range from \$71/mo to \$115/mo on one-year leases. Three year plans are also available. Maintenance is \$11 to \$15/mo. Delivery is 30 days, and the firm is at 12 Toby Road, 06002.



CT-300 System



For the past 20 years or so, American business has been changing its traditional ways of operation to accommodate the special needs of the digital computer.

Now we feel it's high time to start changing the computer to accommodate the special needs of your business.

Not that we intend to become a custom shop, turning out one computer at a time. Our standard line of hardware and software is too good and too broad for that. But the standard product is our starting point, not the end of the line.

For example, we have six Sigma mainframes and a complete line of peripherals, with capabilities ranging from simple data processing to large scale multi-mode operations that include batch, time-sharing and real-time processing,

all at the same time. But to meet your needs we're ready to add special hardware, or modify any of our six Sigmas.

Our standard software includes five full operating systems, a dozen languages, and hundreds of special purpose programs. Enough variety to satisfy everyone. But you're not everyone. To satisfy you we're ready to create a customized package.

The point is, we're going to look at your needs from a total system point of view: What will it take to get the job done? Then we'll tailor our products and service to fit.

We figure the more our computers fit your business, the more business you'll see fit to bring our way.

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You need all kinds of data to run your business: sales figures, production figures, order processing, picking and packing, shipments, work in process, inventory, billing, payroll, and so on.

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Keyplex gathers data from as

many as 64 input keyboard stations at the same time, and there are virtually no format restrictions.

KeyNet communications terminals provide keyboard data entry at remote locations as well as data communication to other KeyNet terminals or a computer.

And because this pre-processed data is all ready to go into your computer, it doesn't have to sit

around waiting for someone to do something. You can use the data for the sort of things where data is useful: making decisions.

Keyplex and KeyNet systems are backed up with Honeywell's software and world-wide support. So while we're concentrating on gathering the data, you can concentrate on turning the information into good, wholesome money.

The Other Computer Company:

Honeywell



For more data, call your local Honeywell Sales Office, or write: Honeywell Information Systems, 200 Smith Street, (MS 061), Waltham, Massachusetts 02154.

Center to Write Software for Quantitative Research

By Michael Merritt
Of the CW Staff

CAMBRIDGE, Mass. — A researcher in quantitative methods probably can't afford a programming staff large enough to give him all the computational facilities he wants. If his budget can stand a terminal and some computer time, though, he will soon be able to dial into an "experimental laboratory" of statistical and simulation techniques.

This is one of the purposes of the new Computer Research Center for Economics and Management Science. The Center is creating the basic software tools for research in quantitative methods, and making them available to all researchers.

The Center's mission to write software for one discipline makes it a unique venture in applied research, according to Dr. Edwin Kuh, executive director of the Center, and Professor of Economics and Finance at MIT.

The Center is being supported by the

National Science Foundation.

"In general," Kuh said, "the social sciences are not compute-bound, but software-bound. We hope to develop a user community by becoming a central source for software, and by becoming involved in quantitative research as well."

Problems Attacked

One of the main problems of free software, according to Mark Eisner, technical director of the Center, is lack of maintenance. He hopes to attack this problem in two ways. First, the software released by the Center will be debugged, documented, and easy to use. Second, the Center will provide updates and revisions to the software.

An example of this is Troll, an operating system designed for interactive regression analysis and simulation by Kuh and Eisner at MIT. Eisner said the current version of Troll has been installed in one or two days, and that the Center offers

training to Troll users.

The Center is re-writing Troll from the ground up. Kuh and Eisner described Troll as a laboratory for researchers. It is interactive, and provides a battery of techniques for quantitative evaluation, simulation, and file management. Through page-sharing, it also allows researchers to access the same file simultaneously.

The main drawback to Troll right now is that it runs on a 360/67 under CP. The 4 Mbyte system has to have virtual memory, and until IBM releases OS/370 or some other virtual memory operating system, use of Troll and other Center software will be limited, Eisner said.

Troll has been installed on several systems already, though, and will be implemented on Nercomp, a computer sharing system of over 100 New England colleges and research centers.

As testimony to the usefulness of the operating system, Eisner said it had al-

ready been used not only by econometricians and political scientists, but by civil engineers for transportation simulation, and by physicists for quantum mechanics modeling as well.

Ambitious Program

The three-month old Center has an ambitious program planned. First is the re-writing of Troll, adding new applications to the system, and modifying it to accept 60 users on 512K, as opposed to the 15-20 it can now handle.

By extensive use of reentrant code and high modularity, Eisner said he hoped to make as easy as possible the conversion from CP-CMS to whatever IBM's new operating system will be. The new system should be ready by June, he said.

Some data analysis packages are under way as well. Spectral analysis is scheduled for release in March or April, and a program for time-domain time-series analysis should be ready by September.

The Center's largest initial effort will be in mathematical programming — linear, integer, and non-linear programming. Troll already supports mathematical programming, but a new version of the package is scheduled for the third quarter of 1973.

The Center will be active in other areas, as well. Kuh said that there is great deal of theoretical work being published on quantitative techniques, but little of it has been given experimental trial because of lack of programming. The Center will begin applying some of the theory to real world data, and may have a significant influence on the direction of research in this area.

Delving Into Analysis

Programmers at the Center will also be delving into data analysis. In addition to the usual estimation techniques, they will be studying data anomalies, variance analysis, cluster analysis, and robust estimation. One effort will be to apply interactive graphical techniques to data analysis.

The purpose of this is to "obtain more realism in a systematic way," Kuh said. Rather than imposing *a priori* constraints on an estimation, then computing and checking for realistic answers, these techniques permit researchers to look directly at the data, and let the data indicate what the parameters of an estimation should be.

Response to the Center has been good, so far, Kuh said, to the extent that they expect to have installation in a half-dozen countries within 18 months, as well as many users in the U.S. Eisner pointed out that foreign users, because they may not have large investments in current programming, can accept new, powerful systems easily.

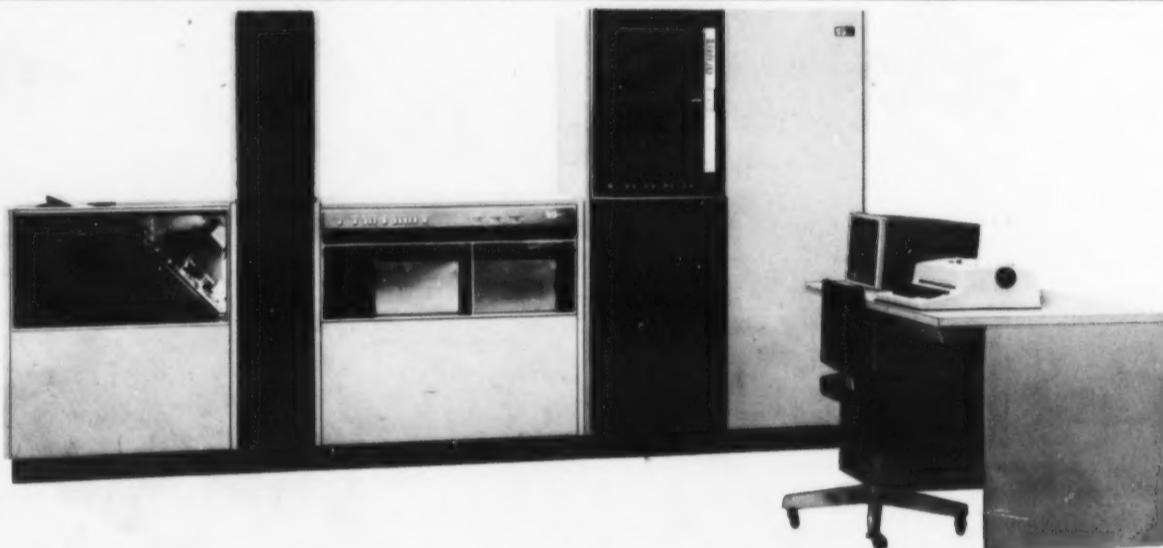
The Center has a \$1.9 million grant from the National Science Foundation for the first two years of operation, and an agreement for \$3 million more for an additional three years. The staff now includes the equivalent of 23 full-time programmers, researchers, and support people, and plans call for increasing that number to 30-35.

The money comes from the NSF's Office of Computer Activities. College users may be familiar with the office because it once supported computer centers. Lately it has been withdrawing this support, and the Center is one of the places its money is now going.

And Now There Are Three Million

WASHINGTON, D.C. — There are now more than three million files in the FBI's computerized National Crime Information Center (NCIC).

To be exact, 3,116,153 is the latest available count from FBI headquarters here. The total includes 107,662 wanted persons, 721,879 vehicles, and nearly one million securities, the largest single category.

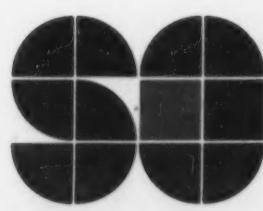


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Caelus CMCX 3330 Pack

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The Forum and Exhibition Schedule Each Day

9:00-9:40
Keynote Address

A nationally known expert who is independent of influence from or affiliation with vendors, delivers an address on the subject of the day. The speaker presents a picture of the state of the art in the subject area under scrutiny. It will be a call to action for the panel discussion and for future efforts by all computer users. The national speaker observes the panels, and delivers a summary during the conference luncheon.

9:40-10:30
Panel Discussion

Panelists are regional experts in the particular field. They have first-hand experience with the latest equipment and services, and they are known in their areas for their progressive management principles. They are not representatives of computer manufacturers.

Principles and operations are the target for discussion, not equipment suppliers. General questions are encouraged.

10:40-11:45
Workshops

Each panelist leads a workshop — and this is where your specific questions are discussed and worked out. Where the discussion goes depends on your needs. What do you, the user, want to learn or discuss?

12:15-1:30
Conference Luncheon

The keynote speaker summarizes the important points of the day's panels and workshops over a pleasant lunch.

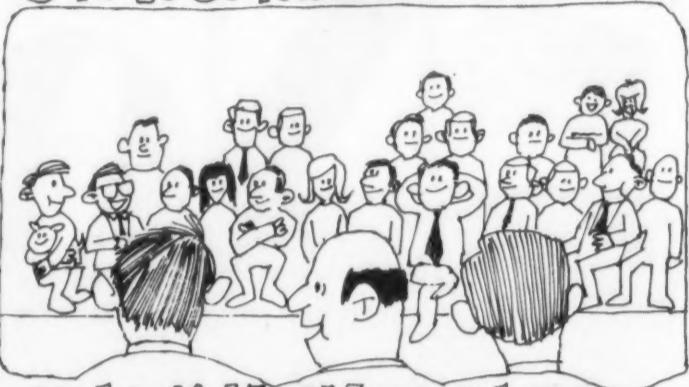
1:00 PM-9 PM
Exhibits Open

You've listened and talked all morning. Now you can see the latest equipment and services in action. 60 exhibitors present their latest, in a pleasant, uncrowded exhibit hall.

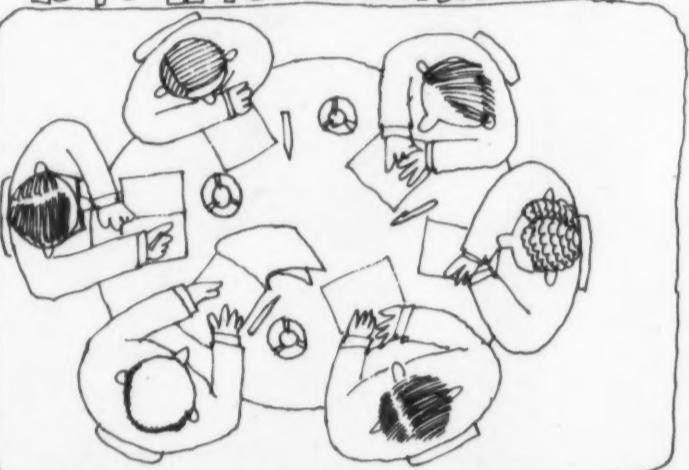
9:00-9:40 KEYNOTE ADDRESS



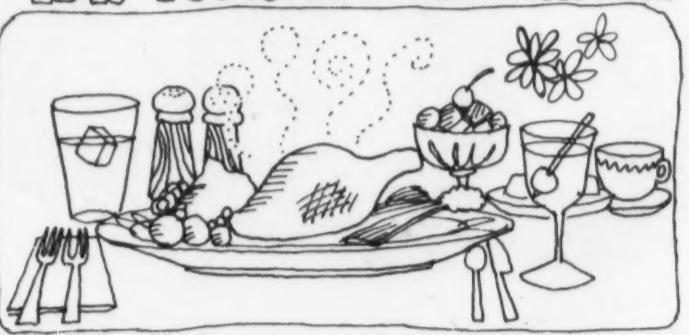
9:40-10:30 PANEL DISCUSSION



10:40-11:45 WORKSHOPS



12:15-1:30 CONFERENCE LUNCHEON



TOPICS

On each day of our three-day show we are devoting our forums to a particular topic of wide current interest to computer users.

First Day

DATA ENTRY

The keynote session on data entry is followed by panels and workshops on

- Keypunch Replacement: key to tape, disk and cassette devices
- OCR
- Intelligent Terminals (distributed processing)
- Direct Data Entry/Source Data Automation

Second Day

DATA COMMUNICATIONS: THE CHOICES

The keynote address deals with the overall picture, and is followed by panels on these subjects:

- Communications equipment from mainframe makers and common carriers
- Communications equipment from independent suppliers
- Data Transmission via private (lines, microwave) networks
- Data Transmission via carriers (lines, microwave)

Third Day

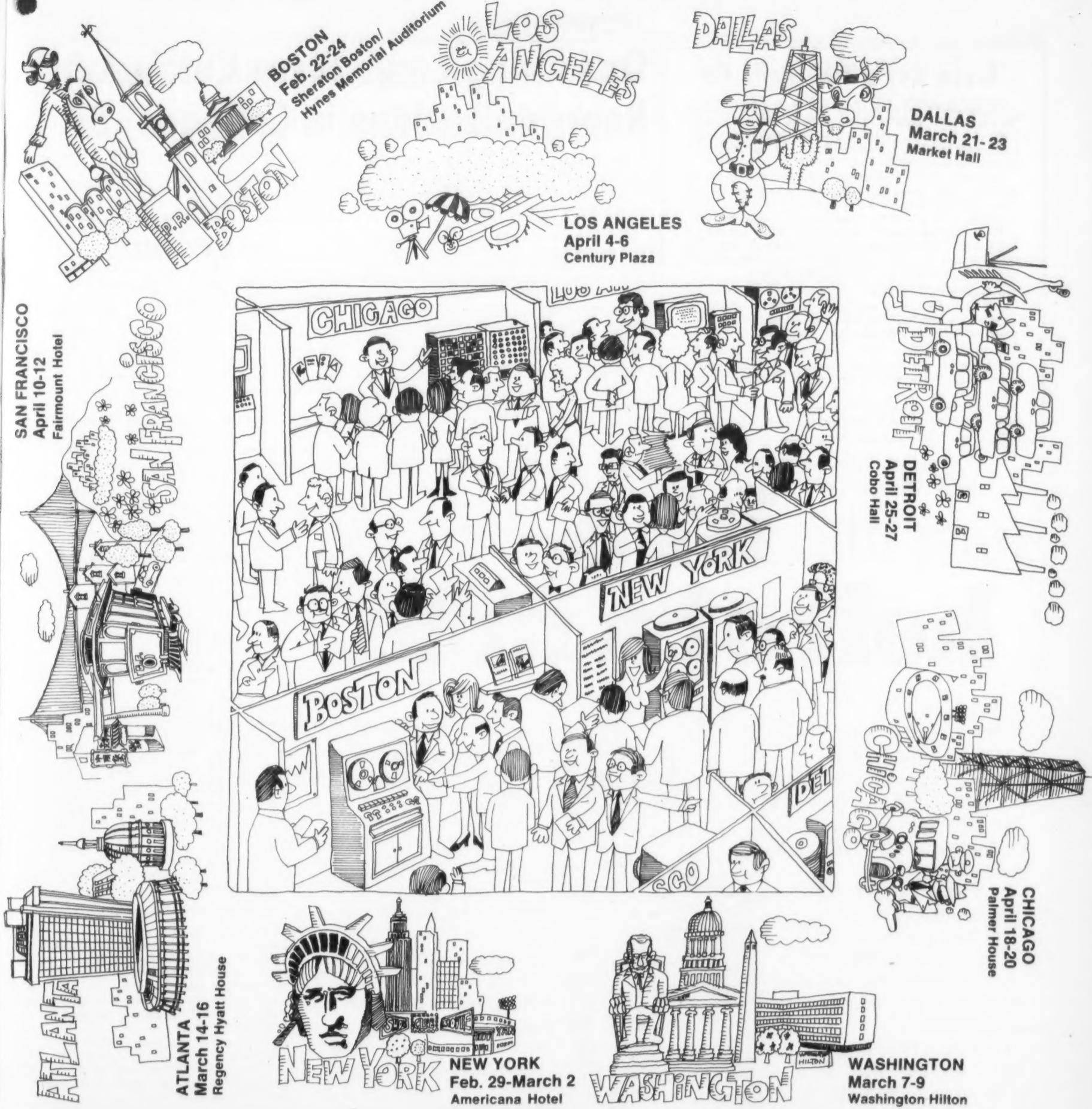
OPERATIONAL EFFICIENCY

Panels and workshops deal with the following topics:

- Core Extensions
- System Utility Software Modification
- Independent Peripheral Usage
- Dedicated Systems vs. General Purpose Computers

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Some of the details are above. The rest will follow in Computerworld. Watch us, and you'll be there when the Computer Caravan opens in a city near you.

THE COMPUTER CARAVAN

Green Bay's 1130 Rolls On

GREEN BAY, Wisc. — How can you provide actual "hands-on" DP experience for students in four separate high schools without either duplicating equipment or disrupting the students' normal schedule by transporting them to a central location?

Four years ago, the local high schools came up with a solution. They installed keypunches, an accounting machine and a computer in a mobile home-type trailer, which is shifted from school to school during the academic year.

The accounting machine has now been eliminated and the original IBM 1620 has just been replaced by an IBM 1130 Model 4, but the trailer continues on its rounds, stopping nine weeks at each of the four local high schools.

In Green Bay, 275 students from all four schools take an introductory DP course as part of their business or clerical curricula. Another 200 or more get exposure to the computer through their math or science classes.

Some 2,000 students attend demonstrations or assemblies each year, and DP instructor Gerald D. Ruge gives interested students a chance to take DP as an extra-curricula activity.

Some students get so involved that they visit the trailer even after it has moved to another school, he said.

Operating Costs Force Cutbacks, Reorganizations in Colleges' DP

CW Staff Roundup

The incredible cost of running effective computation centers or services at the university level has been brought into sharp focus recently as several institutions across the country have begun to pull in their (DP) horns.

Harvard and MIT, neighbors in Cambridge, Mass., have merged some of their computer facilities and the bulk of their computer operations in a venture that is expected to save each of the schools more than \$500,000 annually.

High operating costs were given as the reason for shutting down the computer center at Southern Methodist University in Dallas, and for cutting back DP operations at the City Colleges of Chicago.

The Harvard-MIT merger came as a result of serious financial losses for both institutions.

Although the joint facility will retain two locations, the 370/155 at MIT and the 370/145 at Harvard will be linked in a dual processor con-

figuration, according to Leo Ryan, an MIT spokesman.

Students and faculty at both universities will use the new system for research.

Harvard also plans to use it for a full range of

Education

administrative tasks including scheduling, accounting and inventory control.

MIT has indicated that it will run its "housekeeping" jobs on a separate CPU.

The MIT 370/155 is considered the heart of the new configuration not only because it is a larger machine but also because all but 100K bytes of Harvard's 370/145 are dedicated to gathering and analyzing data from that school's nuclear accelerator.

The available portion of the Harvard CPU is used for remote batch jobs entered from IBM 2780 terminals in several of the graduate schools in Cambridge and Boston.

A study has indicated that the joint facility can be run for about \$1.3 million plus another \$1 million for related user services.

The two universities now share the costs of the computers equally, and the operation is governed by a joint policy board.

SMU Shifts to Time-Sharing

In Dallas, a special committee of Southern Methodist University's board of governors recently decided to remove the school's Univac 1108 and DEC PDP-10 systems.

They were installed at University Computing Company, also in Dallas, and linked to the campus on a time-shared basis with other UCC customers.

While the shift undoubtedly has saved money for SMU, its impact on the school's use of computers is the subject of considerable debate.

Administration sources have said that they expect student usage to increase under the new arrangement. However, when the machines were on campus, students could use them any time day or night. Now they have limited hours of access each month, to the detriment of the computer education program, according to some students.

Illinois Governor's Veto Blamed

High operating costs and Illinois Gov. Richard Ogilvie's veto of a bill to provide funds for junior colleges are blamed for the cutback in computer operations at the City Colleges of Chicago.

Centers on seven campuses, with 39,000 students, have been running an annual deficit of \$3.9 million.

Several equipment leases will be cancelled and the staff will be cut by 10. The cutback is expected to save \$300,000 over the next eighteen months, according to Chancellor Oscar Shabat.

Payroll services and classroom computer time for the seven schools will be taken over by two as yet unnamed private firms, Shabat noted.

Diro 888 Teaches Digital Circuitry

LOS ANGELES — A lightweight, portable digital input and readout device, the Diro 888 from Fabri-Tek Educational Systems provides realistic demonstrations of both positive and negative logic for students of computer circuit design.

A telephone-type dial generates a series of input pulses, bounce and noise free, sufficient to trigger 12 RTL flip-flops. A dial action readout is provided.

The display element is made up of three seven-segment Numetron display stages.

The Diro 888 costs \$295 and is available from 1261 S. Boyle Ave., 90054.

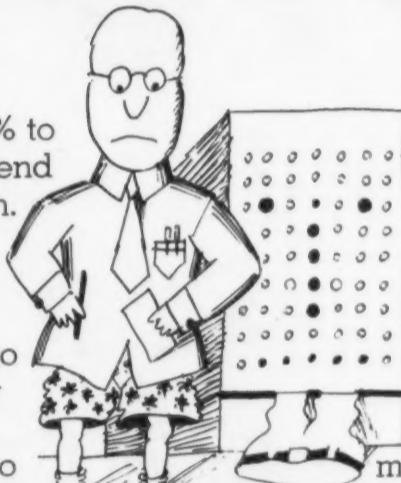
It's a hell of a note.

Most 360 users waste 20% to 50% of the money they spend on core. Month after month. Year after year. And that, by anyone's definition, is one hell of a note.

Fact: CorPak costs 20% to 50% less than the memory that came with your CPU. And you're perfectly free to use it, whether you rent your 360 or own it. Some dp managers don't know that.

CorPak is plug-to-plug compatible with most 360's: Mod 22, 30, 40 and 50. It's built to military specifications, and it will match or beat the environmental specs on your CPU.

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other kind of memory. And it can give you up to twice the core that the mainframe manufacturer is willing to provide.

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Despite Apartheid, Non-Whites Make Inroads in South Africa

By Bohdan O. Szuprowicz
Special to Computerworld

JOHANNESBURG, South Africa — In this land of apartheid there are probably as many as 10% of non-whites employed in the computer industry. Non-white employment is particularly prominent in the data capture and data preparation areas where in some cases non-whites are preferred to whites.

Some local surveys found non-whites much more stable as employees particularly as operators "because they're prepared to stick at operating." Whites, it seems, no sooner learn how to operate a system than they want to progress to programming and on to management.

In data capture, statistics show that there is a 50% turnover among the white employees as compared with only 29.5% for the non-white workers.

A survey of the Johannesburg and Rand areas, which comprise 60% of all the computer installations in South Africa, indicates there are both non-white programmers and operators as well as data capture employees.

15% to 21% Non-White Operators

Among 115 installations surveyed employing 1031 employees, between 3% and 4% of programmers were non-white and between 15% to 21% operators were also non-white. There were, however, no systems analysts who were non-white, although elsewhere in the country some white managers who employ non-whites in their installations are training a few programmers who show aptitude to become systems analysts.

Further "race analysis" of compensation shows that non-whites if they are Indian, Mulattoes, or Chinese receive median or slightly above median salaries while the Blacks are receiving salaries which are predominantly below median level for specific types of work.

This situation worsened for Blacks from 1969 to 1970 while it improved for the other non-white for the same period of time.

Employment of non-white labor is not wide-spread, but there are managers in the country who prefer non-white labor in their data capturing operations.

Apartheid Problems

In many cases the problems of the apartheid crop up when non-white labor is introduced into an office. Whites employed in similar jobs or same area of work may refuse to work with non-whites.

One enterprising manager who decided to employ non-whites (not to be confused with attempts to integrate a company or operation) found that the only way to bring in the non-white keypunch girls was to put up partitions between white and non-white people. Normally, facilities such as rest rooms, trains, buses and in some cases elevators are distinctly marked for white or non-white use, so the problem is confined to the office.

The enterprising manager also found that as time went on non-whites were very stable workers, so he kept increasing their number as well as the number of partitions. Eventually all his data capture staff became non-white and he was able to bring down the partitions.

Personnel Shortage

Although the employment of non-whites in data processing will apparently keep increasing it must be understood the increase does not mean the end of apartheid. In data processing there is an overall shortage of about 20% of personnel. As young and inexperienced whites move into junior management or systems analysis non-whites will increasingly come into the data capture and programming fields.

In keeping with the concept of apartheid, Blacks have a few of their own universities. However, due to a small number of graduates so far, most Black people who do get to study go in for law, economics and other skills of more importance in developing a national power elite rather than engineering or scientific skills.

This situation in part accounts for the need to import white technical skills.

Computer Manufacturer

South Africa is also a computer manufacturer which is well in keeping with its status as a highly industrialized nation. SA Technical Industries of Pretoria designed and manufactures the ISIS 1000 and ISIS 4000. The former has a 4K 18 bit register memory, while the latter an 8K 18 bit register. Both are real-time systems and were designed to make process control or production control computers.

YEAR END "EXTRA" FOR ADVERTISERS

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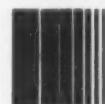
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- 02** Manufacturing — Computer or data system hardware/periipherals/other associated mechanical devices
- 03** Manufacturing (other)
- 04** Utilities/Comm Sys/Transport
- 05** Wholesale/Retail
- 06** Finance/Insurance/Real Estate
- 07** DP Serv. Bureaus/Software/Plann.
- 08** Business Services (except DP)
- 09** Education/Medical/Legal
- 10** Federal, State and Local Govt.
- 12** Communications/Printing/Publ.

YOUR TITLE OR FUNCTION

YOUR TITLE OR FUNCTION

- 01** Operational Management (nonengineering)
- 02** Computer Professional Staff
- 03** Corporate Officer
- 04** Engineering — Mgmt/Scientific/R&D
- 05** Finance/CPA/Accountant
- 06** Consultant
- 07** Sales/Marketing
- 08** Librarian/Educator
- 09** Other:





COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Computer Accounting Necessary

Business Blossoms, So Does Paperwork

NEW YORK — Alan Greenwald, president of Pine Brook Tire Co., a New Jersey wholesale tire distributor, believes "businesses which haven't computerized are falling behind in the battle for profit control."

Pine Brook's sales have doubled in the past three years to more than \$1 million. Customers are mostly tire dealers and gas stations, most of whom charge volume purchases, creating a mammoth bookkeeping problem.

Open Item Statements

The accounts receivable system is handled by DCS Computer Services, Inc. of New York. At

the end of a month, DCS picks up copies of all transactions and prepares self-addressed open item statements with historical ledger cards, individual aging and summarized aged trial balances, plus a management analysis report.

"If we did it ourselves, it would cost a small fortune," Greenwald said. He estimates that the DCS service saves the expense of hiring one or two more clerks. Due to the new computer system, Greenwald says, Pine Brook needs only three part-time bookkeepers.

Four years ago, in Pine Brook's second year of existence, Green-

wald first recognized the potential value of a computer operation.

"Receivables," he explains, "are the heart of any business. Even with our comparatively low volume back then, I found it hard to keep track of who was paying bills on time, and the girls in the office were tired of the end-of-the-month headache of pulling all records into balance."

Million Dollar Sales

Jan. 1, 1969, the year in which Pine Brook first broke the million dollar sales mark, Greenwald decided to give DCS a try at clearing up the paper jungle.

DCS utilizes two IBM 360/30s and a 360/40 to provide its accounts receivables service.

Management Analysis Report

A special management analysis report lets Pine Brook know exactly how much a given customer costs. It shows profitability, sales, volume of returns (a key factor in a wholesale business), the cost of carrying an account, and a credit record analysis.

The report also compares sales activity with the same period last year. Sales can be broken down according to salesmen's territories or virtually any criterion desired. Taking into consideration several pertinent factors, the computers assign a profitability index to each customer on scale ranging from "excellent" to "critically low."

Greenwald says, "It's time to enlist the aid of experts in the field when you begin to drown in your own paperwork just because your business is a booming success."



Intruders Beware

A minicomputer-based system that can be applied to practically any type of process control application is streamlining maintenance operations at the new Bank of America building in Anaheim, Calif. The MUX 2000 system automatically controls and monitors equipment used for building security, fire prevention, and temperature control. From a central console, it can automatically give warning when an intruder enters. The system was developed by American Multiplex Systems, Inc., and incorporates a Digital Equipment Corp. PDP-8/E minicomputer. It reduces costs by optimizing the operation of a building's mechanical and electrical equipment while reducing the need for some maintenance personnel, according to the company.

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DP Model Simulates Urban Growth Process

ANCHORAGE, Alaska — A simulation model analyzing and describing the process of urban growth and aging has been implemented on an IBM 1130 by Lou Barnett, a masters degree candidate at the university here.

Using a closed systems concept, the model's two dominant factors, jobs and housing, determine economic mobility.

The model was designed to further understanding of the nature of a city system, not to predict how any specific city might develop, Barnett said.

He derived the model from studies made by MIT Prof. Jay W. Forrester.

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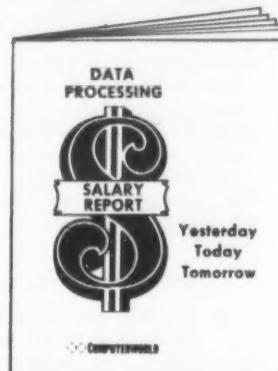
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Computer Industry

a Computerworld news section about the nation's fastest growing industry

November 24, 1971

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CI Notes

Minimakers Contemplate Boycotting TI's Chips

LAS VEGAS — Texas Instruments' (TI) marketing of its 960 minicomputer system may hurt more than it helps.

At the FJCC, several minicomputer makers that buy chips from TI were planning a boycott of their former supplier.

One said that the pricing structure of the TI system could be rough on some of the other manufacturers in the field and that several didn't want to be feeding the hand that was biting them.

At least one firm said it would definitely stop doing business with TI, and indicated others would follow suit.

Consolidated Goes Bust

TORONTO — Consolidated Computer Ltd.'s announcement that it was going into receivership was almost anticlimactic, as the firm has been busy searching for new sources of capital ever since it had to postpone a \$60,000 share offering in the U.S. recently.

Clarkson Co. Ltd. will serve as trustee for the firm which filed under a statute in the Canadian bankruptcy law that is similar to Chapter 11. Under the statute Consolidated can keep operating while it tries to work out a settlement with creditors.

TRW Develops Triple-Diffused Bipolar LSI Circuitry

REDONDO BEACH, Calif. — TRW has developed the triple diffused bipolar LSI process for new LSI circuitry which is said to make higher arithmetic speeds (100 μ sec add time) economically practical in small and medium sized computers. The new circuitry will allow logic designers to use clock rates of 30- to 50 Mbit/sec in special and general purpose processors.

The process will produce a simple LSI with speeds now achieved only by very complex bipolar LSI, and faster than the new silicon gate C-MOS, according to the firm.

Supershorts

Electro Marketing Corp., Tokyo, Japan, will market and service Nemonic Data Systems, Inc.'s plated wire memory systems in Japan.

— — —

California Computer Products, Inc. has centralized sales and support services in Europe under the direction of Brian Higgins, managing director of Calcomp Ltd., London.

— — —

Two new 96-char. read only memories (ROMs) are now available as optional equipment on the non-impact Matrix printers and combination printer/plotters from Versatec, Inc.

— — —

Mitsubishi Office Machinery Co., Ltd. has agreed to act as Japan distributor for the Pertec 3700 computer output microfilmer.

— — —

Pertec Corp. has created Pertec Peripheral Equipment, a new division consisting of Peripheral Equipment Corp.

'Good Show'

Exhibitors at Joint Cite Floor Sales

By a CW Staff Writer

LAS VEGAS — To some the 1971 version of the Fall Joint Computer Conference here last week was a mere shadow of its former self, but most executives engaged in the nitty-gritty of selling on the floor were pleased with the results from the show.

All the big mainframes were absent from the conference, which was dominated by smaller firms occupying less floor space than the giants did in the past.

The smaller firms were pretty well distributed between the OEM side of the business and the end user marketers with a number of hybrid firms that do both thrown in for good measure.

Both booth space and attendance were well off, probably falling at least 30% short of the totals registered during the last JCC here in 1969, during the heyday of industry shows.

But the quality of the leads garnered from the show seemed to increase in inverse proportion to the number of attendees, according to most exhibitors.

One who was at both shows said, "Sure we're seeing fewer people here, but we're also wasting less time with demonstrations to people who have no buying influence in their firms."

"The people we are getting are the ones definitely interested in buying something or are at least serious about the products.

Otherwise their firms wouldn't have let them spend the travel money," he added.

'More Business Here'

Another peripherals exhibitor said his firm had done "more business in the first six hours here than we did in the entire 1969 show."

"This might be the best show ever for us," he added.

While many of the OEM semiconductor and core memory firms were present with new offerings, their number had slipped considerably from the previous year's show in Houston, indicating the attrition and tight money experienced in that field.

The major competition in the show was between the minicomputer makers, with virtually every firm that is a factor in the business, with the exception of Varian, displaying its systems.

There was also hot competition between the cartridge and cassette factions of the low-cost tape drive area, with both sides well represented.

Firms offering trillion bit memories formed a new group at the show. Grumman showed its Masstape system on the floor, Ampex pushed its Terabit system, and Precision Instruments talked up the Unicorn laser memory system.

End user interest was apparently high in the terminal area, for both intelligent terminals and the more mundane systems. There also appeared to be a renewed interest in printers, with several low-cost entries getting good play on the floor.

While some may judge the show a failure because of the decreases in attendees, exhibitors and product offerings, most exhibitors who were selling there said they came away with hard orders that more than made up for the cost of the display.

(Continued on Page 43)

Afips Plans Conference Changes: Broader Appeal, More Services

By E. Drake Lundell Jr.

CW Computer Industry Editor

LAS VEGAS — The purpose and direction of the Joint Computer Conferences are going to get a thorough review that may lead to major changes in the way Afips, sponsor of the shows, conducts future exhibitions.

Afips is leading the move toward possible changes in the shows, and held a meeting of a selected group of 50 marketing executives here last week. Past, present and potential exhibitors attended.

The organization is also taking definite steps toward meeting needs of industry firms, including the establishment of an advisory panel, hiring of a marketing consultant, and establishment of exhibitor and marketing services for future joint conferences.

"If the JCCs are to fulfill their role they will have to meet the needs of all in the industry — users and producers alike," Keith Uncapher, Afips president, told the meeting. "The JCCs will have to meet all of the needs of both OEM companies and the major end user organizations," Uncapher added.

The two major actions announced by Afips to implement the possible new direction involve the establishment of a group of industry advisors and a new consultant to advise Afips on such subjects as site selection, timing and the technical program of the JCCs.

The new Industry Advisory Panel (IAP) will initially be appointed by the JCC board to serve for one year. After that time the IAP will be elected by present exhibitors or some other arrangement.

The panel will consist of top marketing men in the computer industry, Afips spokesmen said, and will be charged with developing suggestions for future directions that the JCCs should take.

In addition, Afips has hired consultant David Sudkin to perform many of the same functions in-house and to investigate the relevancy of the present JCC programs and projects.

Afips officials admitted there had been some movement toward more exhibitor interaction with the program in the past, but said that now the JCC board was more receptive to change and to a possible restructuring of the conferences.

One of the major topics to be taken up by the panel will involve the JCC technical program. One suggestion proposed at the meeting here was to make the program more responsive to specific user segments. To do this the organization

might even consider holding concurrent conferences with other societies representing specific industries, sources in the meeting said.

The group will take a hard, probing look at the sessions and their relevancy to the needs of the industries and help structure them so they will draw the type of attendees needed for a successful show.

The moves are aimed at broadening the shows, making the joints more than component shows just for the computer industry, a source said.

At the same time, however, Afips sources are quick to point out that they do not want to drive the components firms away, but rather to ensure that the joints can more realistically meet their needs and the needs of others in the industry.

(Continued on Page 43)

Software Firms File Antitrust Suit Against Univac and UCC

PHILADELPHIA — A civil antitrust suit seeking \$200 million from the Univac Division of Sperry Rand Corp. and University Computing Corp. (UCC), Dallas, has been filed in federal district court here. The complaint asks a \$50 million judgment and \$150 million in triple damages from the defendants.

Univac has made no comment on the suit, but a UCC official has said "the complaint fails to state a meritorious claim." The original complaint must be answered by Nov. 28, according to sources in the federal court.

The suit, filed by three affiliated software companies, alleges that Univac and UCC worked together to gain control and then put out of business a Minnesota firm that had developed a memory core for Univac's 1108 CPUs.

Three Plaintiffs

Sci-Tek Inc. and United Software Corp., two of the plaintiffs, had planned to market memories built by Weismantel Associates Inc., St. Paul, and software developed by United, as Speed-Pak memory systems for the 1108 that would be cheaper than comparable systems developed by Univac. The third plaintiff is Speed-Pak, a joint venture between Sci-Tek and United Software.

According to the suit, Univac and UCC

used their "enormous financial resources" to block distribution of the Weismantel cores. UCC, which had acquired a substantial interest in Weismantel, caused the company to go bankrupt and stop production altogether earlier this year, the suit claimed.

Although Sci-Tek has not commented officially on the suit, it is known that the "China Lake incident" is involved. In that incident, Sci-Tek was prepared to attach one of its Weismantel-based Speed-Pak systems to an 1108 being used by the Navy, under lease from UCC.

Univac, which had the maintenance contract on the basic system, was concerned about how its responsibilities would be affected if the Weismantel system was used. Although Sci-Tek claims that "Speed-Pak" increases throughput under Exec 8, Univac apparently was worried also about system degradation.

The Navy, caught in the middle, has since said it expects to issue a new Request For Proposal (RFP) to replace the entire 1108 at China Lake with another system capable of providing all the capabilities it now wants.

Independent software and hardware suppliers won't be able to bid for this contract on their own, according to the Navy.

OEM Highlights at FJCC

LAS VEGAS — Intex, Inc., introduced the Race microprocessor, a communications-oriented minicomputer system designed for use as a "building block" in larger computer peripheral and instrumentation systems at the FJCC.

The system features dual memory busses utilizing MOS and bipolar semiconductors, a microprogrammed ROM (read only memory) of up to 64-bit 256 words, a command vocabulary of 190 instructions, and an I/O channel that can accommodate 32 peripheral devices.

The bipolar instruction ROM, expandable up to 2K in 32-word increments having a 250 nsec cycle time, is designed for permanent programs which are first checked out in RAM memory and then transferred to ROM. The MOS RAM is expandable to 16K words in 1K-word increments, and has a cycle time of 950 nsec.

Cost of the Race microprocessor will be less than \$3,900 depending on quantity. Delivery is 30 days from 2612 National Circle, Garland, Texas, 75041.

Quadri Enters Electro-Optics Arena

LAS VEGAS — Quadri Corp. has entered the electro-optics market with the Model 814 Dual Optical Isolator, and the Model 815 "Opticable."

The Model 814 Dual Optical Isolator, featuring rise times of 20 nsec to 30 nsec, is said to be suited to high-speed data link applications. The Model 814 is a two-channel system contained in a 24-pin dual inline package and is TTL-compatible on both input and output.

Each of the two channels consists of a gallium arsenide emitter, a PIN diode, a high gain amplifier, and an output driver stage.

The Model 815 optical cable provides complete ground isolation, the firm said. It is TTL-compatible and requires 5 V

power.

The firm is at 2950 W. Fairmont, Phoenix, Ariz. 85017.

Warner Electric Unveils Step Motors

LAS VEGAS — A line of variable-reluctance step motors was unveiled by Warner Electric Brake & Clutch Co. here.

More than 50 standard variable-reluctance (VR) step motors in three different designs, seven step angles and 16 torque ratings, spanning the horsepower range from subfractional to about one horsepower, plus options and associated controls and accessories comprise the line.

The Warner Electric motors are designed for: card and paper drives, printers, incremental tape recorders and chart drives, punched tape readers and punches, and X-Y positioning systems and punches.

Other applications include: machine tool table drives, drafting machines, computer-controlled inspection equipment, remote indicating and recording devices, and digital analyzers for analog recordings.

Warner Electric VR step motors are digital actuators that "step" in fixed increments of motion in response to input signals, such as digital pulses and operate bi-directionally.

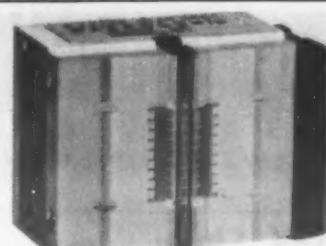
The firm is at 449 Gardner St., Beloit, Wis., 53511.

Bucode Shows Tape Drive Series

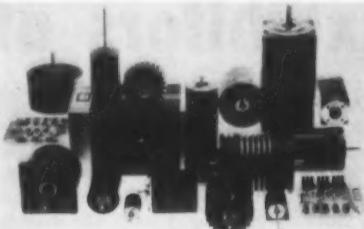
LAS VEGAS — Bucode, Inc. introduced a new 4000 series of low-cost auto-threading tape transports.

The 4000 series is priced around \$3,200 and features automatic loading, tape speeds to 125 in./sec and rewind speed to 500 in./sec. The transport complete with NRZI and/or PE data electronics is packaged in a 19 in. by 24.5 in. rack-mountable unit.

Model 4025 offers tape speeds from 75-



Magnusonic Model 221-9



Warner Step Motors



EM Sems-8 Planar Memory



Remex RAF 3075

Nortronics is at 8101 Tenth Ave. North, Minneapolis, Minn. 55427.

UTE Shows Memory Stack

LAS VEGAS — A core memory stack, billed as the world's smallest, and a "do-it-yourself" system were introduced by United Telecontrol Electronics, Inc.

The new stack is less than half the size of the previously smallest known commercial stack, UTE said. It is 4 in. by 4 in. by 4.5 in. Total area of the UTE stack is 18 sq. in.

It provides 4K by 12 to 18 bits of core storage, and will operate at a speed of 650 nsec, with 18 mil cores. The stack offers 3-wire, 3-D organization and provides two diodes per line.

The do-it-yourself memory system features a cycle time of 900 nsec and an access time of 325 nsec. It consists of one control card and up to eight 4K by 18 storage cards.

The memory may be purchased either as a complete ready-to-use unit, or as a do-it-yourself kit. The kit contains all necessary drawings and the core stacks.

The system is designed to operate from -20 V to +5 V dc. Operating modes include read/restore, clear/write, read/modify/write. All inputs and outputs are compatible with TTL or DTL integrated circuits.

UTE estimated that the manufacturing cost of the system, using the kit approach, will approximate 0.8 cent/bit. The design package is available for immediate delivery from 3500 Sunset Ave., Asbury Park, N.J.

DDC Has Head/Track Disk Unit

LAS VEGAS — A head-per-track disk memory system, the Series 6000, has been announced by Digital Development Corp.

The series is offered in two configurations: the Model 6100 with capacities from 1- to 4 Mbits and from 16- to 64 tracks in increments of 16, and the Model 6200 with capacities from 1- to 8 Mbits and from 16- to 128 tracks, also in 16-track increments.

Average access time is 8.7 msec. Prices for both the Model 6100 and 6200 start at less than \$5,000 in single units, with 60-day delivery. DDC is at 5575 Kearny Villa Road, San Diego, Calif. 92123.

Nortronics Exhibits Cassette Heads

LAS VEGAS — Nortronics Co., Inc. exhibited its new series of Mini-Digital .150 in. read/write heads for cassette equipment and a new magnetic reader.

Three styles are available covering three price ranges. Category I heads, all-metal face units, are designated P-DC11P and P-DC21P, indicating 1- and 2-channel read/write configuration, respectively. These heads are encased in an aluminum block.

Category II precision soft-mount heads, the DC11P and DC21P, are encased in a Mu-metal can, and require an adjustment mount to yield a precise measurement between first track and base.

Category III cassette heads, the DC11R and DC21R, provide lower precision, but still meet many cassette format requirements at lower cost.

The RAF3075 reader/punch combination is priced at \$2,195 each in small quantities with quantity discounts available. Delivery is 60 days. An interface card and cable is available for most mini-computers for \$1,000 in low quantities.

The firm is at 1733 Alton St., Santa Ana, Calif.

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FJCC Sights

Digital Development Corp.'s Julius Honig shows firm's 6000 disk system to Bob Wheeler, Datawest Research.



J.F. Bartholomew demonstrates features of Pertec's Model 5000 disk drive.



Edwin Weble explains Dicom Model 440 vacuum cassette drive to Jack Hikima, Matsushita Electric Co.

Afips Plans Conference Changes

(Continued from Page 41)

"Beginning at the 1972 Spring Joint we are going to offer more detailed information on attendees," Uncapher said.

In addition the JCC board is planning to provide sessions, panels and seminars outside of the technical program that are specifically oriented to marketing subject matter.

Afips said it was "running

scared" because the trade show climate had been rough for the past couple of years, but that it was trying to upgrade the services that it could offer.

A source said the organization was "deadly serious" about its plans and that definite actions would be taken.

"It's not just a public relations ploy to keep exhibitors happy," one official said.

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Number of Cassette, Cartridge Makers Focus Attention on Standards Question

LAS VEGAS — Backers of the cassette concept for low-cost tape storage were out in force at the FJCC here last week with several new products, but cartridge proponents also were pushing their concept hard.

The different emphases forced the question of standards to the forefront.

While most of the action in the new product area came from the cassette manufacturers, Digitronics made a big pitch with its NCT-7 mini cartridge system, which is an adaptation of the Novar cartridge system specially designed for the OEM environment.

Reception to the unit, Digitronics sources said, was "excellent," both at the show and during previous marketing efforts.

Both the cassette and cartridge representatives at the conference felt two different standards would eventually result — one for cassettes being offered and another for cartridges that are evolving.

While they would not make predictions as to future standard specifications, several said they felt IBM was moving toward acceptance of the present Ecma standard which includes the Philips type cassette.

Such a move by IBM would remove one of the major obstacles to getting a cassette standard passed by the American National Standards Institute, they said.

The shape of a standard for cartridges, however, seems to be further away, proponents admitted. No one would predict its exact nature, even though representatives from Novar and Digitronics are obviously betting that the Novar cartridge will become at least a de facto standard.

At the joint, Kybe Corp. jumped into the tape and tape transport system market with the introduction of the Kydek cassette tape system and cassette tapes, Kystettes.

The dual transport unit was demonstrated with a DEC PDP-8e although it is being offered as a plug-to-plug, software compatible unit for all major minicomputer series.

"The market for tape management equipment is now relatively mature and the growth rate parallels the overall computer industry growth rate. It is less than a \$10 million annual market. On the other hand, the digital cassette market is now beginning to come into its own,"

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noted Richard Munn, vice-president of marketing.

"Although a number of firms are currently in this market, none is a dominant factor, and there is definitely extensive revenue potential there," Munn estimated the size of the paper tape replacement market initially targeted by Kybe at some "\$100 million annually."

Kydek's read/write rate is 750 char./sec. The dual transport permits the user to read and write simultaneously, and the data recording density allows storage of over 180,000 characters on a single 300-ft cassette, Kybe said.

The Kydek is priced at \$3,495, with first deliveries scheduled for the first quarter of 1972.

Sykes Datronics, Inc. unveiled the Series 2000 Cassette Tape Controller (CTC), designed to interface one or two Model TT 120 High Performance Tape Transports to a variety of interfaces.

Both the EIA (RS232C) compatible and TTY current loop interfaces are standard. When used with the EIA compatible interface, the CTC allows the system to receive data from a

modem or terminal and write the information on tape or it can read from tape and transmit the data to a terminal or modem.

Used with the TTY current loop interface, the system can accept data asynchronously from a teletypewriter, block the data, and write it on tape. The unit can then read the batched data and transmit it to either the teletypewriter or to an EIA compatible modem.

In OEM quantities the unit costs under \$1,500.

Cipher Data Products showed its new cassette drive system called the C-2000. The unit offers Ans/Ecma compatibility, read-after-write, and record and file back-spacing, high-speed file load, and bi-directional search.

Based upon the previously developed C-200 cassette transport, the new system utilizes the Ans/Ecma checking scheme including both a longitudinal check bit and a check sum.

Interfaces are available for most minicomputers and standard software includes I/O drivers and a diagnostic package.

Pricing starts at \$2,450 for a single cassette system in unit quantities.

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Improved Second Quarter**Cybermatics 6-Month Earnings Decline**

FORT LEE, N.J. — Despite increased revenues for the quarter and six months ended Sept. 30 and a 50% rise in earnings from the preceding quarter, software vendor Cybermatics Inc. reported decreased earnings for the two periods.

During the second quarter, sales were \$1.8 million and earnings totaled \$98,670, or 9 cents a share, up 50% from the previous quarter's net of \$62,247, or 6 cents a share, on sales of \$1.5 million. Restated earnings for the second quarter 1970 were \$120,035, or 12 cents a share, on sales of \$1.4 million.

For the six months, revenues

rose to a record \$3.2 million from \$2.7 registered in the same period last year. Earnings dropped to \$160,917, or 15 cents a share, from \$213,146 or 22 cents a share, restated for the first half of 1970.

The reduced earnings during

the first half were a direct result of start-up expenses on several new contracts, according to Chairman J. Roy Morris.

These contracts should, however, add to increased third and fourth quarter results, Morris added.

Tally Registers Losses

KENT, Wash. — Peripherals maker Tally Corp. reported a loss for the third quarter and year to date but forecasted a return to profitability in 1972 as the result of an enlarged product line coupled with economic recovery in its market.

The loss for the quarter ended Oct. 3 was \$552,000. For the nine month period Tally registered a loss of \$1 million, on revenues of \$7.6 million, compared with earnings of \$263,685, including a net operating loss carryforward of \$125,000, on revenues of \$10.8 million in the same period last year.

The firm switched to the operating method of accounting during 1971; had figures been reported in a comparable manner with 1970, revenues would have been \$8.6 million and the loss cut to \$585,982.

The loss for the third quarter was aggravated by the behind-schedule status of Datascribe key-to-tape data communication recorders, the continued use throughout 1971 of the operating method of recording rental income from leased equipment, and unforeseen delays in introducing new products, commented President James E. Navarre.

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New Registrations

ATLANTIC TECHNOLOGY CORP., 7th St. and New Hampshire Ave., Somers Point, N.J., manufacturer of peripheral equipment involving CRT displays and related systems, filed to register 200,000 shares of common with 200,000 warrants, to be offered for sale in units, each consisting of one share and one warrant. Proceeds, at \$6 unit maximum, intended to repay short-term debt and other liabilities and the balance for working capital. The underwriter has not yet been named.

INTERNATIONAL COMPUTER PRODUCTS, INC., 601 N. Dooley Road, Addison, Tex., a company engaged in the design, development, manufacture and sale of computer and data communication equipment, filed to register 150,000 shares of common stock to be offered for public sale at \$6 per share maximum. The underwriter is Provident Securities, Inc.

INTEL CORP., 3065 Bowers Ave., Santa Clara, Calif., a company primarily engaged in designing, developing, manufacturing and marketing advanced semiconductor memory circuits, filed to register 350,000 shares of common stock to be offered for sale at \$25 per share maximum. The underwriters are headed by C.E. Unterberg, Towbin & Co.

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Nickels & Dimes

Good news at Data General. For the year ended Sept. 25, the mini maker tripled its net income, reaching \$1.7 million, or 72 cents a share, over last year's \$536,000, or 27 cents a share. Sales doubled, from \$7 million to \$15.2 million.

\$\$\$

It seems like 1968 — firms are making money, reporting record revenues. Some of the Thanksgiving cheer:

In Palo Alto, Tymshare reported revenues for the nine months climbed to \$9.3 million from \$7.6 million a year ago, and net income was \$404,882, up from \$88,010 a year earlier — 14 cents a share against 4 cents a share. Earnings were effectively doubled by tax loss carryforwards in both years, though.

Programming Methods has reported a 104% rise in revenues, and a 34% rise in earnings for this nine months over last years'. Revenues hit \$8.8 million, compared with \$4.3 million last year, and net earnings topped \$540,000, or 60 cents a share, up from \$404,599, or 47 cents a share a year ago.

And Electronic Associates is in the black. Nine months' sales were \$20.6 million, and produced a profit of \$52,000, or 2 cents a share. A year ago the period's sales were \$21.7 million, but EA had an operating loss of \$4 million and an extraordinary loss of \$3.8 million, which resulted in a per share loss of \$3.04. For 1971, EA also had a tax loss carryforward that brought earnings up to \$185,000, or 7 cents a share.

\$\$\$

There are some losses, too. General Computer Systems (GCS) dropped \$596,000 in

fiscal 1971, equivalent to 56 cents a share, on sales of about \$2 million. But last year the young company lost about \$1 million, or \$1.66 a share, on sales of a resounding \$5,000, and GCS President Albert Beiser said shipments for the first half of 1972 seem likely to hit \$3 million.

\$\$\$

For the first quarter of 1972, Sanders Associates had earnings of \$460,000, or 10 cents a share, up from \$193,000, or 4 cents a share a year ago. The trouble is that \$214,000 of the increase, or 5 cents a share, came from a tax loss carry-forward. Sales fell from \$37.7 million to \$29.6 million. President Royden Sanders termed the 1972 sales goal of \$143 million to \$160 million "a realistic goal for the year."

\$\$\$

In fiscal 1971, Calcomp earned \$2.3 million, or 98 cents a share, on revenues of \$44.7 million, all well up from 1970 earnings of \$807,000, or 35 cents a share, and revenues of \$27.6 million. Current backlog is \$60 million, and the company estimates sales will rise another \$12 million in the current year.

\$\$\$

And some modest heroics: Astrodata, working in Chapter 11 bankruptcy, has completed its second profitable quarter, according to its receiver, J.P. Stodd. While audited statements aren't yet available, sales for the year to date are \$3.4 million and backlog is over \$4 million, Stodd said. Astrodata went Chapter 11 last December, listing assets of \$3 million and liabilities of \$11.3 million.

Earnings Reports**WANG LABORATORIES**

Three Months Ended Sept. 30

	1971	1970
Shr Ernd	\$1.14	\$1.18
Revenue	7,853,154	7,748,012
Earnings	557,995	712,459

Sights at FJCC



Ralph Venditt of Univac and Bruce Alper from Arizona State University try out the 550 solid-state keyboard from Licon, a division of Illinois tool works.



Marvin Jacoby of Digitronics shows interest in the 812 Alterable ROM shown by David Ripley of Quadri, which makes the system.



Phil Davy of Basic Four looks over the PM 1200 memory from Plessey Memory. Plessey's William Zadel demonstrates features.



Potential buyer checks out the LMN 600 semiconductor memory offered by Litton Guidance and Control. (CW Staff Photos by Lundell)

Many Minis Meet

DEC Unveils PDP-11/03

LAS VEGAS — Digital Equipment Corp. (DEC) was the only major minicomputer maker to introduce a new system at last week's FJCC although nearly all major competitors were represented with an abundance of OEM and end-user systems.

At the same time, Digital Computer Controls (DCC) presented the first public showing of the D-116, which is program and mechanically interchangeable with Data General's Nova 1200 machine.

Some industry sources had predicted DCC would not show the machine publicly, since it is presently being sued by — and countersuing — Data General over patent rights.

Data General, Hewlett-Packard, Cincinnati-Milicron, Texas Instruments, Computer Automation, Microdata, and Xerox were among the minimakers exhibiting.

With the withdrawal of the large mainframe makers from the show, it seemed that their little brothers in the industry were one of the main sources to take up some of the slack.

The new DEC system, the PDP-11/03, is a communications-oriented system designed for distributed computer sys-

tems. It will sell for under \$2,560 in quantities and \$3,995 in single units. It has a 2K-, 4K-, 8K-, or 16K bytes of memory in a 3-1/2 in. high cabinet.

"Because this is the only byte-oriented, fully parallel 16-bit processor available at this low price," DEC feels it will find wide use in distributed computing systems, according to Andrew Knowles, PDP-11 group manager.

It will find applications in remote job entry and with intelligent terminals, and in the process control and instrumentation areas, Knowles added.

The PDP-11/03 is compatible with all five other members of the PDP-11 family, including the recently announced PDP-11/45 computer.

The 11/03 includes a central processor unit with a 1.2 μ sec cycle time memory, power supply, serial communications interface and programmer's console.

"In addition, there are several other standard features on the PDP-11/03," Knowles said, "such as power fail/auto-restart, direct memory access (DMA), automatic priority interrupt, and hardware stacks."

Deliveries are scheduled to begin next year.

DEC said it had registered over \$1 million in sales of the PDP-11/45 computer since it was introduced last month. DEC made the first public demonstration of the system at the show.

"Well over 1,500 PDP-11 systems have been delivered so far and we recently increased production on the line by 40%," Knowles said.

The D-116 from Digital Computer Controls has a 1.2 μ sec cycle time and is capable of executing instructions in 1.35 μ sec, the firm claims.

The system's complete CPU is held on a 15 in. by 15 in. printed circuit board as is a 4K 16-bit memory module. The unit is priced at \$2,400.



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College Gets Big Donation

CRAWFORDSVILLE, Ind. — Wabash College now has a PDP-11 for instructional use, thanks to an anonymous donor.

Plans call for the initial installation of eight time-sharing terminals at various campus locations.

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Computerworld Stock Trading Summary

All statistics
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TRADE QUOTES, INC.
Cambridge, Mass. 02139

CLOSING PRICES THURSDAY, NOVEMBER 18, 1971

EXCH	PRICE					
	1971 RANGE (1)	CLOSE NOV 18 1971	WEEK NET CHNGE	WEEK PCT CHNGE		
SOFTWARE & EDP SERVICES						

O ADVANCED COMP TECH	1- 4	1 1/4	- 1/2	-28.5	N NASHUA CORP	29- 47	45	0	0.0
A APPLIED DATA RES.	5- 13	5 1/8	+ 3/8	+7.8	O REYNOLDS & REYNOLD	37- 63	56 1/2	+ 1/2	+0.8
O APPLIED LOGIC	1- 3	3/8	0	0.0	O STANDARD REGISTER	14- 23	14 3/8	0	0.0
N AUTOMATIC DATA PROC	4- 66	57 5/8	- 3/4	-1.2	N TAB PRODUCTS CO	8- 17	15 3/4	+ 1/4	+1.6
O AUTO SCIENCES	1- 8	3/4	- 1/8	-16.2	N UARCO	24- 34	24 1/2	- 3/4	-2.9
O COMPUTER NETWORK	2- 11	5	0	0.0	A WABASH MAGNETICS	5- 10	5 5/8	- 1/2	-8.1
O COMPUTER PROPERTY	5- 11	5 1/2	- 1/4	-4.3	N WALLACE BUS FORMS	18- 26	21	+ 7/8	+4.3
N COMPUTER SCIENCES	6- 17	6 7/8	- 1/4	-3.5					
O COMPUTER TECHNOLOGY	4- 11	4 1/2	+ 1/8	+2.8	COMPUTER SYSTEMS				
O COMPUTER USAGE	5- 16	5 5/8	- 7/8	-13.4	N BURROUGHS CORP	105-143	128 7/8	-2 1/8	-1.6
O COMP AUTOMOT REPORTS	6- 13	7 1/4	0	0.0	N COLLINS RADIO	10- 20	10 1/4	- 1/2	-4.6
N COMPUTING & SOFTWARE	19- 45	19	- 5/8	-3.1	N CONTROL DATA CORP	37- 83	37 1/8	- 1/4	-0.6
O COMRESS	2- 4	1 1/2	- 1/8	-7.6	O DATA GENERAL CORP	19- 65	47 1/2	-1 1/4	-2.5
O COMSHARE	4- 8	4 1/4	0	0.0	O DIGITAL COMP CONTROL	4- 24	11	-2 3/4	-20.0
O DATA AUTOMATION	1- 4	1/2	+ 1/8	+33.3	N DIGITAL EQUIPMENT	53- 85	63 3/8	-2 1/8	-3.2
O DATA PACKAGING	6- 10	6 1/4	- 1/2	-7.4	N ELECTRONIC ASSOC.	5- 9	4 5/8	0	0.0
O DATAMATION SERVICE	1- 3	1/2	0	0.0	A ELECTRONIC ENGINEER.	5- 10	7 1/8	- 3/8	-5.0
L DATATAB	4- 10	6 1/8	0	0.0	N FOXBORO	25- 46	26	-1 1/4	-4.5
O EDP RESOURCES	5- 16	5 3/8	- 3/8	-6.5	N GENERAL AUTOMATION	9- 26	12 1/4	- 1/4	-2.0
A ELECT COMP PROG	2- 7	2 3/8	- 1/8	-5.0	N HEWLETT-PACKARD CO	30- 46	38 1/8	0	0.0
N ELECTRONIC DATA SYS.	34- 85	33 5/8	0	0.0	N HONEYWELL INC	83-115	108 1/2	+ 2 3/4	+2.6
O INFORMATICS	6- 15	6	- 1/2	-7.6					
O I.O.A. DATA CORP	1- 3	7/8	- 1/4	-22.2	LEASING COMPANIES				
A ITEL	7- 23	6 3/4	+ 1/4	+3.8	A BOOTHE COMPUTER	11- 27	12 1/2	- 1/8	-0.9
O KEANE ASSOCIATES	4- 14	5	0	0.0	O BRESNAHAN COMP.	2- 4	1 3/4	0	0.0
O KEYDATA CORP	5- 18	8 1/2	+ 3/4	+9.6	O COMPUTER EXCHANGE	2- 9	2 1/8	- 1/8	-5.5
A MANAGEMENT DATA	5- 11	4 7/8	- 3/8	-7.1	A COMPUTER INVSTRS GRP	8- 14	7 3/4	0	0.0
N NATIONAL CSS INC	7- 14	7 1/4	- 1/2	-6.4	O DATRONIC RENTAL	9- 19	8 7/8	- 5/8	-6.5
O NAT COMP ANALYSTS	1- 4	1/2	0	0.0	A DCL INC	5- 13	7 1/8	- 5/8	-8.0
P ON LINE SYSTEMS INC	7- 18	8 1/2	0	0.0	A DEARBORN-STORM	12- 23	18 1/2	- 5/8	-3.2
N PLANNING RESEARCH	12- 26	11 1/2	0	0.0	A DPA, INC.	4- 9	7 3/8	- 1/4	-3.2
O PROGRAMMING METHODS	16- 29	18	-1	-5.2	A GRANITE MGT	7- 13	7 3/4	- 1/4	-3.1
O PROGRAMMING & SYS	1- 4	1 1/2	+ 1/8	+9.0	A GREYHOUND COMPUTER	7- 11	7 5/8	+ 1/8	+1.6
O SCIENTIFIC COMPUTERS	2- 3	2 1/2	0	0.0	N LEASCO CORP	16- 26	19 1/4	- 1/2	-2.5
O SIMPLICITY COMPUTER	1- 4	3 1/4	- 3/8	-10.3	O LECTRO MGT INC	2- 5	3 1/4	- 1/2	-13.3
O SOFTWARE SYSTEMS	1- 3	7/8	0	0.0	O NCC INDUSTRIES	3- 8	6 1/4	+ 1/4	+4.1
O TBS COMPUTER CENTERS	4- 9	4 1/4	- 1/4	-5.5	A ROCKWOOD COMPUTER	3- 9	3 5/8	+ 1/8	+3.5
O TOLLEY INTL CORP	3- 8	7	+1	+16.6	O SYSTEMS CAPITAL	3- 7	5	+ 1/8	+29.0
O TRACOR COMPUTING	2- 5	2	+ 1/8	+6.6	N U.S. LEASING	16- 39	34 1/2	+ 1/8	+0.3
O TYMSHARE INC	4- 15	6 3/4	- 1/8	-14.2					
O UNITED DATA CENTER	2- 7	4 7/8	- 3/8	-7.1	EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE L=NATIONAL EXCHANGE; O=OVER-THE-COUNTER P=PHIL-BALT-WASH O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID (1) TO NEAREST DOLLAR				
N UNIVERSITY COMPUTING	15- 38	15 1/2	+ 1/2	+3.3					
A URS SYSTEMS	5- 11	4 3/4	- 1/2	-9.5					
O VORTEX CORP	2- 6	5 3/4	- 1/4	-4.1					
PERIPHERALS & SUBSYSTEMS									
N ADDRESSOGRAPH-MULT	24- 48	28 1/2	-2	-6.5					
O ALPHANUMERIC	1- 6	1 1/8	0	0.0					
N A1PEX CORP	14- 25	14 5/8	+ 7/8	+6.3					
O ANDERSON JACOBSON	6- 10	5 1/2	0	0.0					
O ATLANTIC TECHNOLOGY	3- 8	3 1/8	+ 1/4	+8.6					
A BOLT, BERANEK & NEW	4- 8	4 3/4	+ 1/2	+11.7					
N BUNKER-RAMO	6- 17	6 1/8	+ 1/8	+2.0					
A CALCOMP	15- 33	14 1/2	- 1/4	-7.9					
O COGNITRONICS	2- 9	2 1/4	+ 1/4	+12.5					
O COLORADO INSTRUMENTS	2- 8	1 3/4	0	0.0					
O COMPUTER COMMUN.	6- 19	5 5/8	- 5/8	-10.0					
A COMPUTER EQUIPMENT	3- 7	2 5/8	- 1/4	-8.6					
A COMPUTEST	5- 20	4 5/8	0	0.0					
CONSOL COMPUTER LTD.	1- 12	1 1/4	+ 1/4	+25.0					
A DATA PRODUCTS CORP	3- 10	4 3/8	+ 1/8	+2.9					
O DATA RECOGNITION	3- 8	4 1/4	- 1/4	-5.5					
O DATA TECHNOLOGY	3- 9	3 3/4	+ 1/8	+3.4					
O DIGITRONICS	2- 8	3 7/8	+ 1/2	+14.8					
N ELECTRONIC 'A & M	5- 16	5 1/2	+ 3/8	+7.3					
O FABRI-TEK	2- 4	2 1/8	- 1/8	-5.5					
O GENERAL COMPUTER SYS	6- 10	7 1/2	+1	+15.3					
N GENERAL ELECTRIC	53-124	56 7/8	+ 1/2	+0.8					
O INFOREX INC	17- 49	19 1/4	+ 2 1/4	+13.2					
O INFORMATION DISPLAYS	5- 8	3 3/8	- 5/8	-15.6					
O MANAGEMENT ASSIST	1- 2	3/4	- 1/8	-14.2					
A MARSHALL INDUSTRIES	7- 27	8	+ 1/2	+6.6					
N MEMOREX	21- 78	21 1/8	0	0.0					
A MILGO ELECTRONICS	12- 26	12 1/8	+ 1/8	+1.0					
N MOHAWK DATA SCI	15- 47	14 5/8	- 3 1/4	-18.1					
O OPTICAL SCANNING	6- 18	6 3/8	- 1/8	-1.9					
O PHOTON	6- 12	7 1/4	+1	+16.0					
O POTTER INSTRUMENT	13- 25	12 7/8	- 1/2	-5.7					
O PRECISION INST.	7- 16	9 1/2	+ 1/2	+18.7					
O RECOGNITION EQUIP	9- 26	12	+ 3 3/8	+39.1					
O REDCOR CORP.	1- 9	1 3/8	- 1/8	-8.3					
N SANDERS ASSOCIATES	10- 22	9 5/8	- 3/8	-3.7					
O SCAN DATA	6- 15	9 3/8	+ 3/4	+8.6					
O TALLY CORP.	7- 16	6 3/4	- 1 1/2	-18.1					
N TELEX	10- 22	9 1/2	- 1/2	-5.0					
SUPPLIES & ACCESSORIES									
N ADAMS-MILLIS CORP	10- 19	9 1/2	- 1/2	-5.0					
O BALTIMORE BUS FORMS	6- 10	8 5/4	0	0.0					
A BARRY WRIGHT	7- 13	7 1/2	+ 1/4	+3.4					
A DATA DOCUMENTS	14- 29	15 1/2	+1	+6.8					
O DUPLEX PRODUCTS INC	8- 11	11 3/8	+ 1/8	+1.1					
N ENNIS BUS. FORMS	6- 13	5 5/8	- 1/4	-4.2					
O GRAHAM MAGNETICS	9- 35	14 7/8	- 3 5/8	-19.5					
O GRAPHIC CONTROLS	6- 15	10 5/8	- 7/8	-7.6					
N 3M COMPANY	96-126	121 1/4	+ 2 1/8	+1.7					
O MOORE BUS. FORMS	36- 42	37 1/4	0	0.0					

Computerworld Stock Trading Summary

All statistics
compiled, computed
and formatted by
TRADE QUOTES, INC.
Cambridge, Mass. 02139

CLOSING PRICES THURSDAY, NOVEMBER 18, 1971

1971 RANGE (1) 1971 RANGE (1)

1971



Vickie Stewart, 12, shows how easy it is to operate a Digitronic 200 printer.



Digital Equipment provided its entire 11 series of computers.



DuPont demonstrates its fire killing Halon FE 1301 using a real man in a gas chamber.

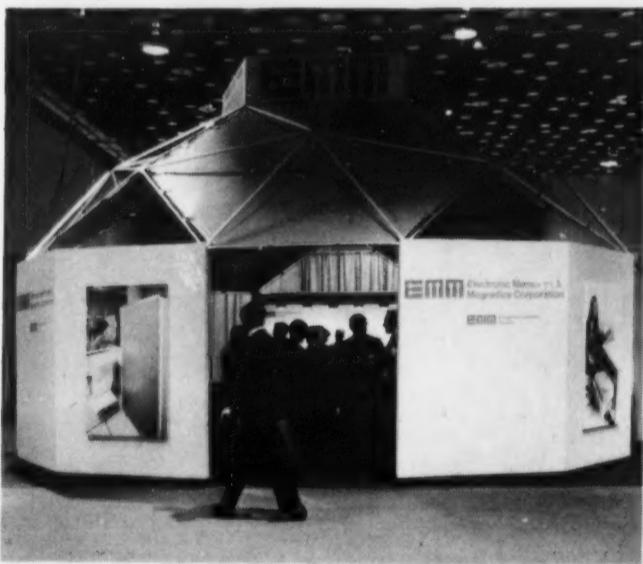
Pictures From the Fall Joint



Hewlett Packard Booth gets lots of attention as it had the most working systems in operation.



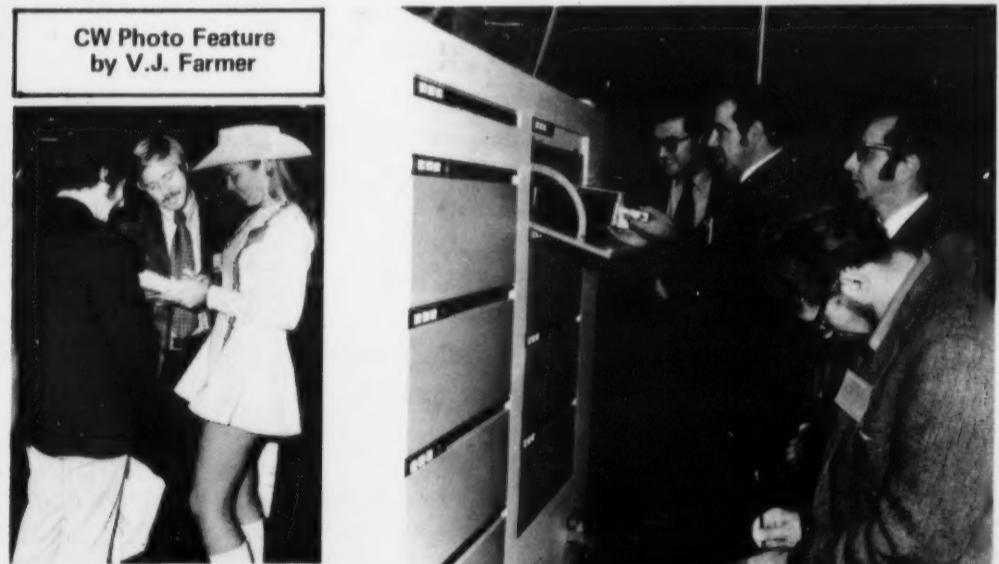
Potter managed to sneak a working replacement for an IBM 3330 on the floor with little fanfare.



Electronic Memories and Magnetics announced lower priced core replacements.



Afips Cowgirls polled attendees reactions.



Grumman's prototype Masstape system gets worked over.



Bunker Ramo displays varied dedicated CRT applications.



United Airlines shows how you too can load your own container for computer air shipment.



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